May APR 10 1918

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WRITTEN SO YOU CAN UNDERSTAND IT

Safety First *for* Air Fighters

See Page 659

Banished to Siberia

The Czar of all the Russias, the most powerful autocrat on earth, has been banished to the cold and desolate land to which thousands of his subjects have been banished in years gone by, as a result of autocratic rule. The tragedy of the Czar's overthrow and banishment is only equalled in history by Napoleon Bonaparte's exile to St. Helena. Again throughout the world thrones tremble and empires totter in the great world war now in progress. How are we to judge of the momentous questions confronting the peoples of the whole world except from the lessons of the past? This knowledge can be acquired only from the reading of history.

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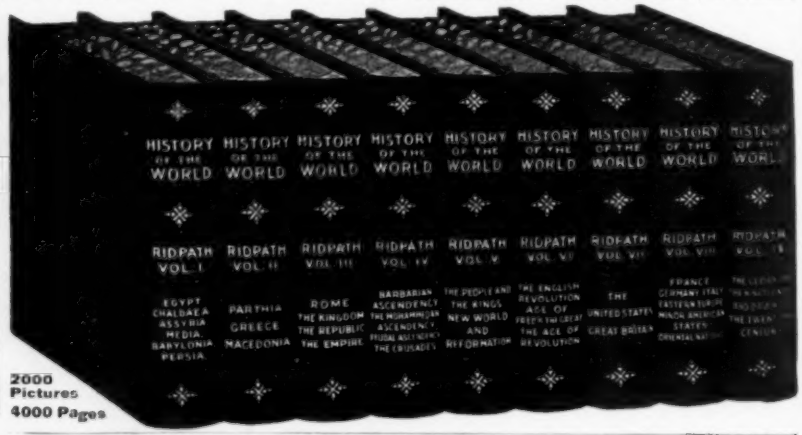
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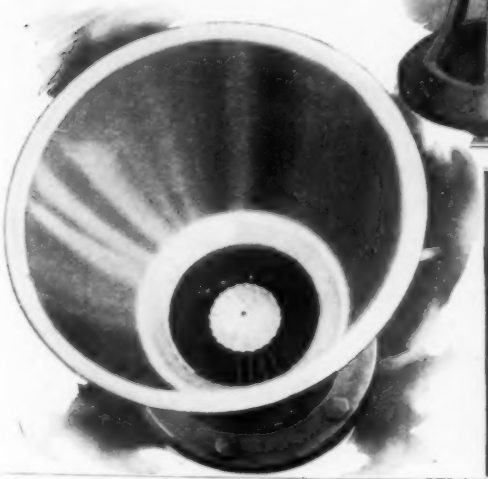
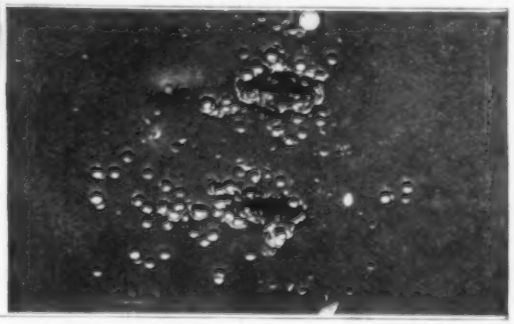
Vol. 29 MAY, 1918 No. 5

Electric Trench Gun Fires at Terrific Speed

IN the vernacular of the trenches a machine gun is a "coffee mill." And now there comes into the limelight a weapon that looks like a coffee mill and operates like a cream separator. Moreover it is designed to slaughter Huns more rapidly and economically than existing instruments. It is a centrifugal gun that hurls as many as 3,000 steel balls a minute without employing explosives of any kind. The contrivance, in the mind of its inventor, is adapted to replace machine guns in the first-line trenches. The mechanism is preferably driven by an electric motor incorporated in the body of the device, but other means may be employed. The missiles are fed from a hopper to a disk that revolves at terrific speed. They are hurled with sufficient force to pierce ⅜-in. boiler plate at 100 yd., it is claimed. The weapon has no barrel or sights, and in no physical respect whatever resembles a rifle. Essen-

The Weapon Looks More Like a Coffee Mill Than a Machine Gun, and Operates Much Like a Cream Separator. It Is a Centrifugal Catapult Capable, It is Claimed, of Firing 3,000 Steel Balls a Minute





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Above at the Left Is an Interior View of the Hopper Which Feeds the Balls to the Revolving Disk. At the Right is Pictured the Effect the Gun Has on Boiler Plate at a Distance of 150 Yards

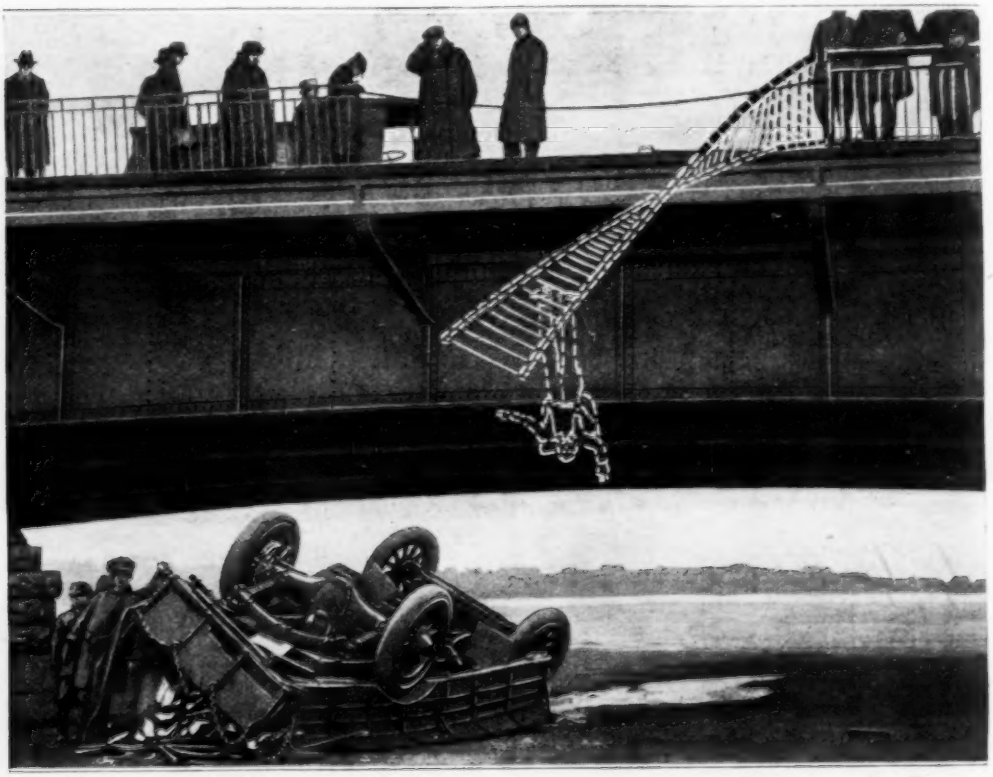
tially it is a high-power catapult of entirely new design. The firing plate may be tilted up or down and swung to the right or left so that the trajectory and direction of a stream of bullets are regulated in the conventional manner. With the firing speed five times greater than that of the fastest machine gun, the inventor believes the weapon capable of great effectiveness. Obviously the most difficult feature of its operation is the task of keeping the hopper filled with balls. The operator would require assistance for this.

CAR LEAVES BRIDGE, DRIVER LIVES, AND ICE HOLDS

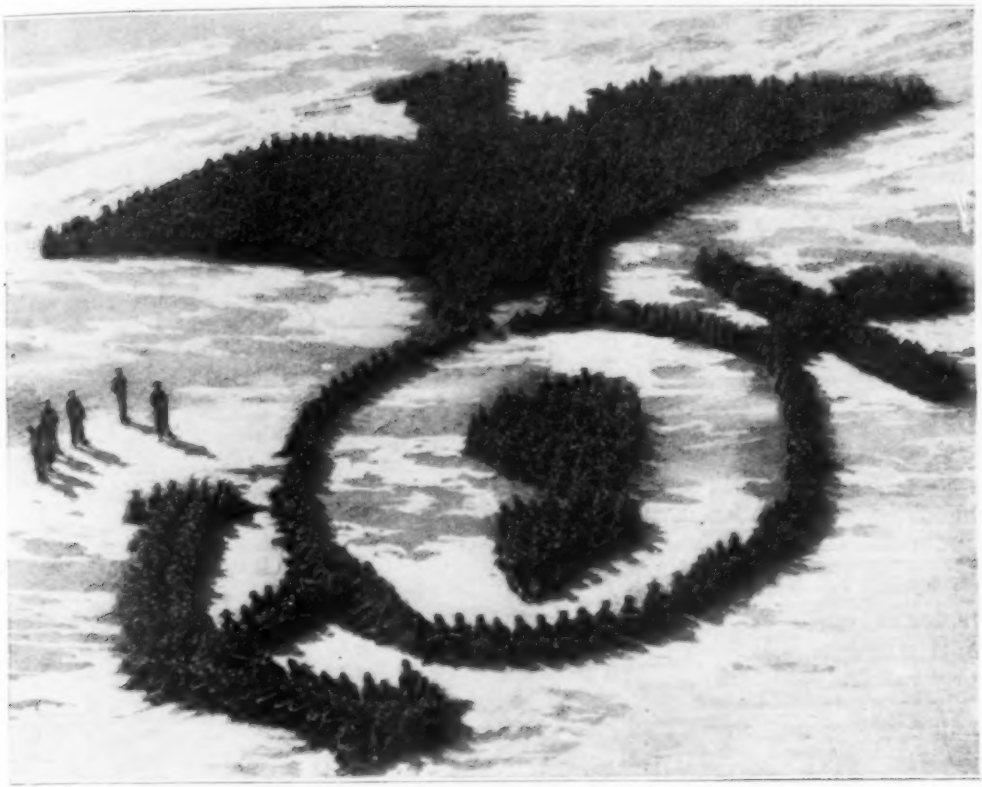
By a strange caprice of fate, the driver of a heavy motor truck that plunged 30 ft. from a bridge to the frozen surface of the Charles River, at Boston, some weeks ago, escaped death. As the machine smashed through the iron railing the man was catapulted into the air. Instead of following the car, however, he fell in such a way that his feet caught in the rods of a section of the railing that hung, ladderlike, from the edge of the bridge. He remained suspended, head down, until rescued. So thick was the ice it was not even cracked by the impact that wrecked the truck.

THREE THOUSAND MEN FORM HUGE MARINE INSIGNE

Approximately 3,000 marines were recently grouped on their parade grounds at Paris Island, S. C., to form a Marine Corps insigne of huge dimensions. However, the likeness scarcely rivaled



The Man Hung Suspended, His Feet Fast in the Railing, Until Rescued. The Ice was Not Even Cracked When the Truck Hit It



Marines at Paris Island, South Carolina, Forming the Marine Corps Insigne: It Required an Hour and 45 Minutes to Pose the 3,000 Men in This Picture

the flag, described in February Popular Mechanics Magazine, that was composed of 10,000 men at the Great Lakes Naval Training Station.

PORTABLE ELECTRIC HOIST FOR GRAIN-STORAGE BINS

Instead of equipping its deep grain-storage bins with expensive ladders, a Chicago firm uses a specially built portable man hoist. The machine, in addition to effecting an initial saving of about $2,000, is more convenient than ladders when workmen go into the bins to sweep the walls and remove accumulated dust. One of the advantages is that a man may be swung to any position desired. Power is provided by an electric motor that is supplied with a magnetic brake so that, when the current is shut off, the hoisting drum is locked. Successful use of such equipment of course depends upon the elimination of all obstacles to its free movement.

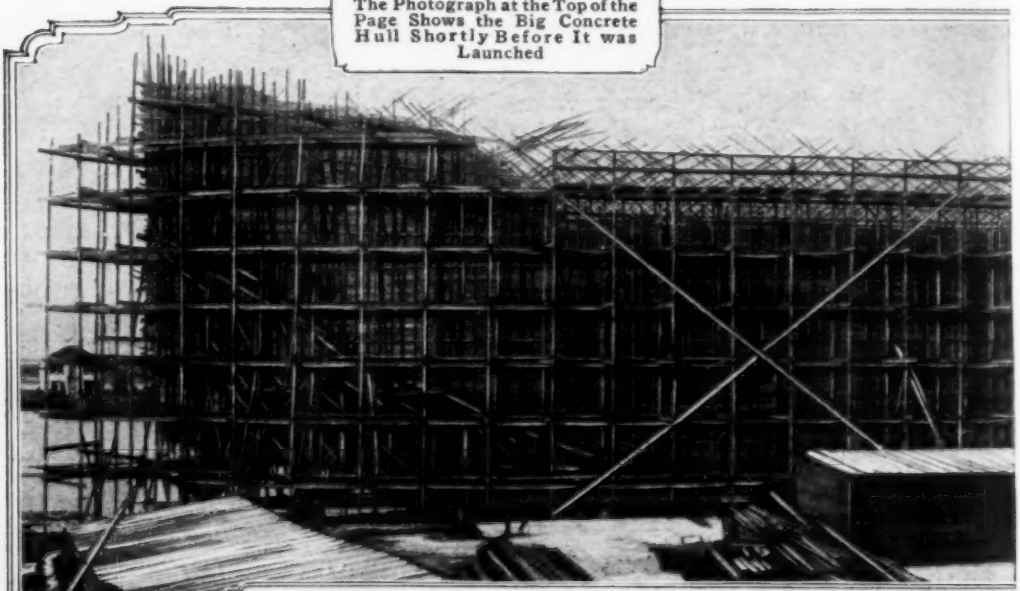
A Portable Hoist That Takes Place of Ladders for Deep Grain-Storage Bins

World's Largest Concrete Ship

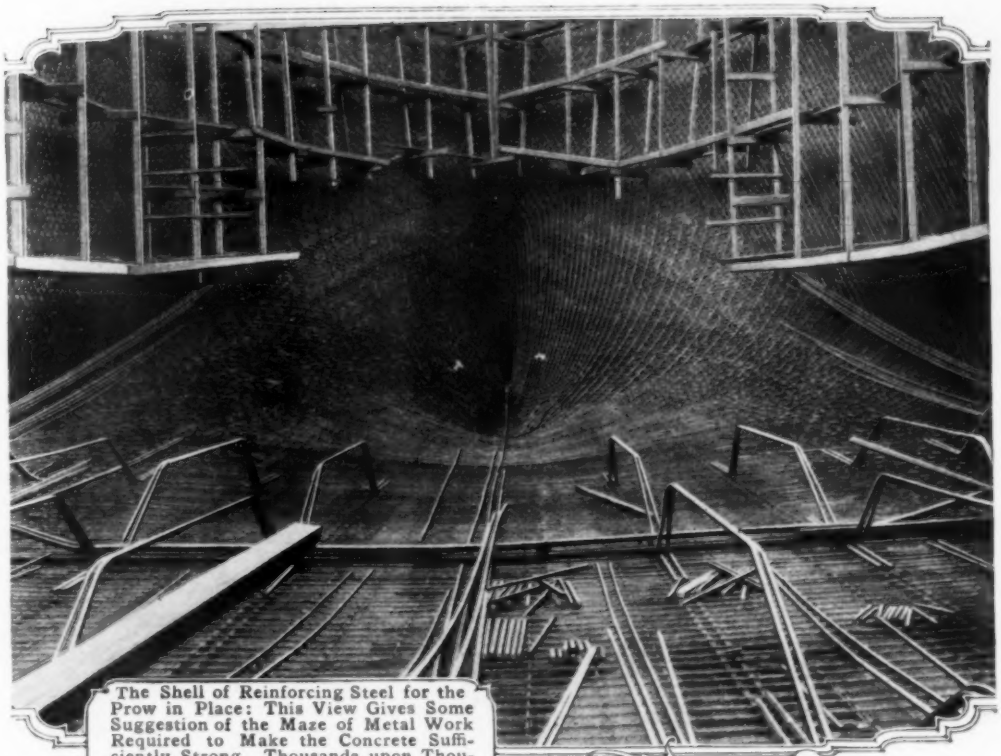
Made in America

WITHIN recent weeks the world's largest reinforced-concrete ship has been launched at Redwood City, Calif. The vessel was built in a six-month period. It is 336 ft. over all, 45 ft. of beam, and has a dead-weight carrying capacity of 5,000 tons. Fully loaded, with a displacement of 7,500 tons, it will have a speed of about 11½

Looking Down the Full Length of the Deck of the 336-Foot Ship: The Photograph at the Top of the Page Shows the Big Concrete Hull Shortly Before It was Launched



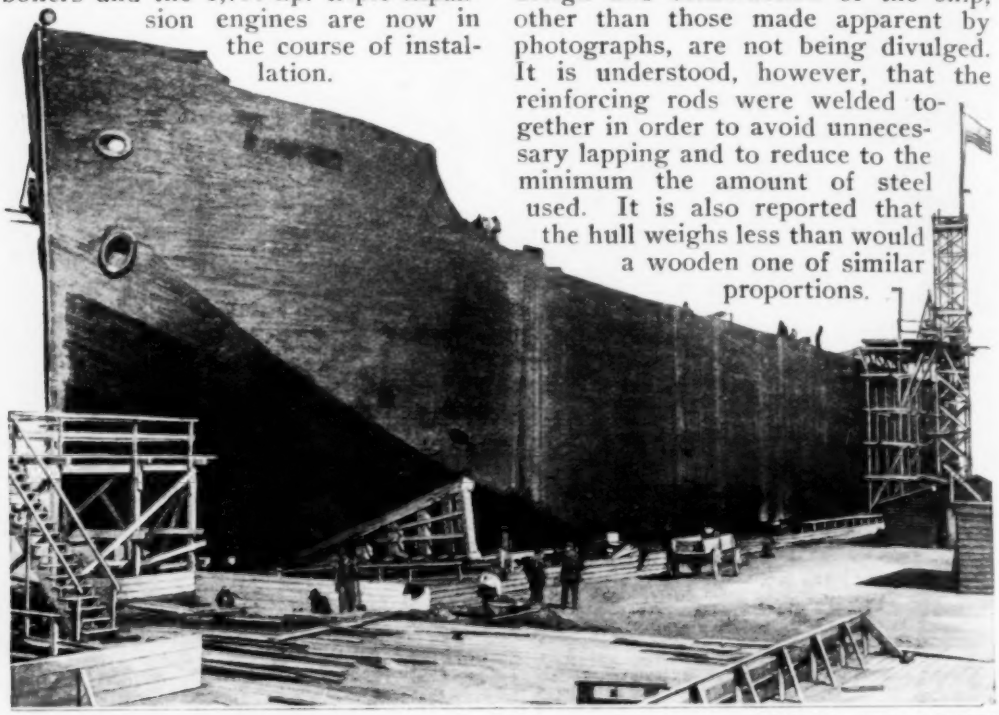
Scaffolding and Forms into Which the "Faith" was "Poured," Composed of 400,000 Niceties, Used Unmatched Lumber Almost Entirely in Making This Mold. The viceability. Its Shape Is Almost Identical with That of Steel Tank Steamers Whose was Launched Six Weeks After the First Concrete was Poured and It is Asserted Move from One to Another without Delay, Each Vessel could be Poured in 10 Days. Type Shown could be Set



The Shell of Reinforcing Steel for the Prow in Place: This View Gives Some Suggestion of the Maze of Metal Work Required to Make the Concrete Sufficiently Strong. Thousands upon Thousands of Rods are Crossed and Interlaced, Making Patterns as Intricate as Embroidery Work. Because the Problems Involved in This New Type of Work Were Similar in Many Respects to Those Encountered in Ordinary Large-Scale Concrete Construction, the Builders Were Able to Proceed at a Remarkable Pace

Feet of Lumber: The Builders, Knowing That the Present Was No Time to Stop for Result Is the Hull Appears Rather Rough, but That in No Way will Affect Its Ser- Dependability in All Kinds of Weather has been Amply Demonstrated. This Vessel That if There Were Ways for a Score of Similar Ships, So Placed That Crews could While Figures have been Withheld, It is Thought That Standardized Forms of the Up in Two or Three Weeks

miles an hour. Its Scotch marine boilers and the 1,750-hp. triple-expansion engines are now in the course of installation.



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A Great Day in the History of American Shipbuilding: Launching the "Faith", Which Is a Forerunner of Many Concrete Vessels That Promise to Play a Significant Part in Winning the War. It is Stated That This Hull Weighs Less Than Would a Wooden One of Similar Dimensions

The freighter has been christened the "Faith," and is to enter the Pacific service. It is the first vessel built by a company that started the construction of its ways only last August. Work on the boat itself began in September. The speed of its construction and its size are at first thought somewhat surprising. It is interesting to know, however, that the "Faith" is to be followed by boats of 7,500-ton capacity and that the company expects to be able to construct 54 of them in 18 months.

It is reported that only $15,000 was invested in the yard where the initial craft was laid down. This is a striking phase of concrete shipbuilding. Extensive equipment is not required, as is well illustrated by the character of the power plant employed in the construction of the "Faith." It was the simplest possible installation for operating a mixer and hoist. For obvious reasons, technical details of the design and construction of the ship, other than those made apparent by photographs, are not being divulged. It is understood, however, that the reinforcing rods were welded together in order to avoid unnecessary lapping and to reduce to the minimum the amount of steel used. It is also reported that the hull weighs less than would a wooden one of similar proportions.

It is worthy of note, in this connection, that the government has perfected a large organization for building concrete ships.

RICH OIL-SHALE RESERVES FOR OUR NAVY

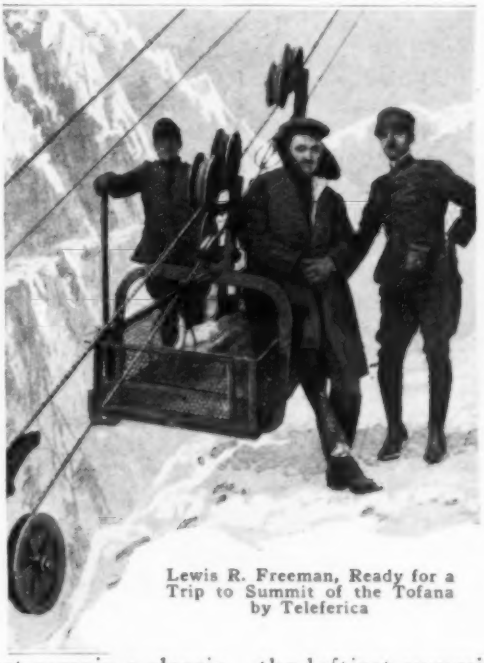
During the past year two oil-shale reserves have been set aside for our navy, one of over 45,000 acres in Colorado, and the other of over 86,000 acres, in Utah. Investigation by the Geological Survey indicates that this land should yield a commercial supply of oil possibly at a price that would make it a competitor of petroleum. The potential resources of this region are estimated at billions of barrels. Some of the deposits carry from 30 to 50 gal. of oil to the ton. There is also available an extensive supply of nitrogen which could be recovered as a by-product and used for fertilizer or explosives.

"THE BASKET ON A STRING"

Some of the Remarkable Uses to Which the Italians have Put the Teleferica or Aerial Tramway

By LEWIS R. FREEMAN

"JOLLY good work I call that for a 'basket on a string,'" was the way a visiting British officer characterized an exploit of the Italians in the course of which—in lieu of any other way of doing it—they had shot the end of a cable from a gun across a flood-swollen river and thus made it possible to rig up a *teleferica* for rushing over some badly needed reinforcements.



Lewis R. Freeman, Ready for a Trip to Summit of the Tofana by Teleferica

The Italians' conduct of their Alpine campaign must remain a classic of mountain warfare — something which has never been approached in the past and may never be equaled in the future. According to the most approved pre-war strategy, the proper way to defend mountain lines was by emplacing guns on the heights commanding the main passes and thus rendering it impossible for an enemy to traverse them. The fact that these commanding positions were in turn dominated by a still higher one, and these latter by others, until the loftiest summits were reached, was responsible for the struggle for the sky-line positions which the Austro-

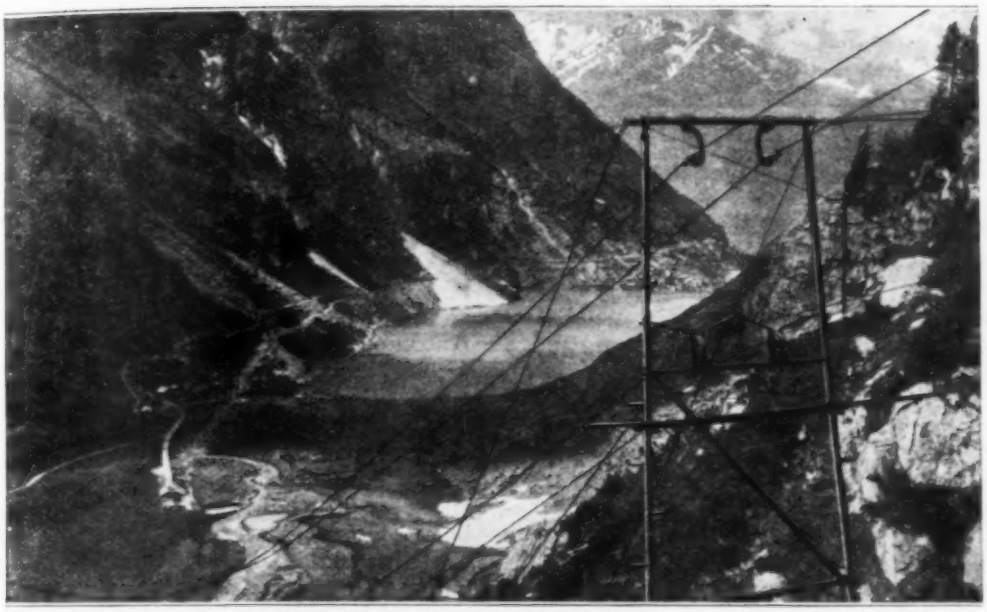
Red Cross Dugout on a Teleferica Route in the Corso: All Supplies are Brought Up by the "Basket on a String" and a Detail of Men Are Always on Duty

Italian war quickly resolved itself into. This kind of a war would have been a sheer impossibility two decades ago, for the simple fact that no practicable means of transport could have been devised at that time capable of carrying men, munitions, guns, and food up to continuous lines of positions from 10,000 to 13,000 ft. above sea level. The one thing which did make this feat practicable at the present time was the development of the compact internal-combustion engine, by the use of which, in automobiles and motor trucks, swift and reliable transport could be assured on such mountain roads as could be kept open all the year, and which as a motive power for aerial tramways made it possible to maintain an all-year and all-weather service to points in the mountains where the foot of man had scarcely trod before the war.

Wounded Soldier Starting from a High Alpine Post for a Base Hospital in the Valley: So Reliable Are the Teleferica Systems That Even the Sick Travel over Them without Apprehension

Theoretically, a *teleferica* can be of any length, though I think the longest on the Italian front is one of three or four miles which makes a good part of the 8,000-ft. climb up to the summit of the Pasubio, in the Trentino. A *teleferica* has never more than its two terminal stations, no provisions being made for a "break of journey" between these. If the topography of a mountain is such that a continuous cable cannot be run the whole distance that it is desired to bridge by *teleferica*, two—or even three or four—separate installations are built. This is well illustrated in the ascent of the Adamello, the highest position on the Austro-Italian front. One goes to the lower station of the first *teleferica* by motor, if the road is not blocked by slides, of course. At the upper station of this two-mile-long cableway a tramcar, pulled by a mule, is taken for the journey over three or four miles of practically level narrow-gauge railway. Leaving this, a hundred-yard walk brings one to another *teleferica*, in the basket of which he is carried to its upper station on the brow of a great cliff towering a sheer 3,000 ft. above the valley below. Three hundred yards farther up, another *teleferica* begins, which lands him by the side of the frozen lake at *Rifugio Garibaldi*. Three more *telefericas* —with breaks between each—and a dog-sled journey figure in the remainder of the climb before, at last, the glacier and summit of the Adamello is reached.

Though I have had many a *teleferica* journey that was distinctly thrilling—what ride through the air on a swaying wire, with a torrent or an avalanche below, and perhaps shells hurtling through the clouds above, would not be thrilling?—I have never figured in anything approaching an accident, and only once in an experience which might even be described as "ticklish." This latter befell through my insistence on making an ascent in a *teleferica* on a day when there was too much wind to allow it to operate in safety. It was on the Adamello in the course of an ascent



Section of One of the Adamello Telefericas: The Cable Is 1,500 Feet above the Valley at One Point

which I endeavored to make toward the end of last July.

There was a sinister turban of black cloud wrapped around the summit of the great peak, and before we were halfway up, what had been only a cold rain in the lower valley was turning into driving sleet and snow. We ascended by the first *teleferica*—a double one—without difficulty, but the ominous swaying of the cables warned that the more exposed line next in order might be quite another matter. This latter is the one I have mentioned before as running from an Alpine meadow to the brow of a cliff towering 3,000 ft. above it.

This Lofty Pinnacle Is Only Accessible by Teleferica. The Lines may be Dimly Seen against the Dark Rocks

As we had feared, we found this *teleferica* "closed down" upon our arrival at the lower station, ample reason for which appeared in the 15 or 20-foot sway given to the parallel lines of cable by the powerful side-on wind gusts which assailed it every few moments from the direction of the glacier. Fortunately, as the storm was only coming in fitful squalls as yet, and had not settled down to a steady blow, the *tenente* in charge thought that it might be possible to send us up in one of the quieter intervals.

"There's no danger of the baskets blowing off the cable," he said; "it's only a matter of preventing them striking together in passing, of which there is always risk when the wires are swaying very far."

As there were three of us and the carrying capacity of the basket was limited to 200 kg. (about 440 lb.), it was necessary to attempt two trips. As the heaviest of the party, it was decided that I should ride alone, starting after the two others had gone up together. The squalls were blowing harder and longer all the time, but,

taking advantage of a brief quiet spell, my companions were started off. There was still a good deal of sway to the cables, but a lookout above kept the engineer advised as to conditions as the baskets approached each other, and the passage was made without incident. When my turn came to start, however, the storm had settled down to a steady gale, and the *tenente* said he did not dare take the responsibility of trying to send me through. Ordinarily I should have been only too ready to acquiesce in his ruling, but as my companions had just phoned word that they had already gone on by the next *teleferica*—a comparatively protected one—to the *Rifugio Garibaldi*, where they would await me before starting on the next stage of the ascent, I realized at once that my failure to appear would throw out the whole itinerary and make the trip (which had to be finished that day or not at all) a complete failure. It was plainly up to me to get through if there was any way of doing it, and I accordingly suggested to the young officer that I would gladly sign a written statement taking the responsibility for an accident on my own shoulders.

"That would not help either you or me very much if things happened to go wrong," he said with a laugh. "If you really must go, you must, that is all, and we shall simply do our best not to have any trouble. I shall send one of the linemen along with you to fend off the other basket in case it swings into yours in passing. There is a returned *Americano* here who ought to be able to do the job and talk to you in your native tongue at the same time."

Even the Sure-Footed Mule Rides to His Work at Some Inaccessible Alpine Base in One of the Cableway Baskets

And so it was arranged. I took my place—lying on my back in the bottom of the basket as usual—after which Antonio—grinning delightedly at the prospect of keeping watch and ward over a "fellow countryman"—climbed in and knelt between my feet, facing up the line. Then the "starter" banged three times on the cable to let the engineer at the top—he had already been informed over the telephone of the plan afoot—know all was ready, and presently we were off along the singing wire.

The ordinary motion of a *teleferica*—though not quite so smooth and vastly slower—is not unlike that of an aeroplane. On this occasion, however, the swaying of the cable furnished a new sensation which, while mildly suggestive of the sideslip of an aeroplane on a steep "bank," was rather more like the "yawing" of a "sausage" balloon in a heavy wind.

A chill current of spray began to enfold us and Antonio was just in the midst of an explanation of how it was carried by the wind from a thousand-feet-high, quarter-mile-distant waterfall coming down behind the curtain of the lowering clouds, when I suddenly saw him bring the point of his alpenstock over the edge of the basket and, with his eyes fixed intently ahead, hold himself poised in an attitude of tense readiness. Just so (the thought flashed across my mind) had I seen a Marquesan native waiting, machete in hand, to receive the charge of a wild boar; and not so very different from the straight-from-the-shoulder stab with which that dusky

hunter plants the point of his blade just behind the neck of his quarry, was the quick lunge of his alpenstock with which Antonio turned aside—for the fraction of a second necessary for it to pass harmlessly by—the reeling "down-bound" basket which had come charging toward us out of the mist.

It had been easy this time, explained Antonio, because the engineer at the top had slowed down the baskets to under half speed at the moment of their passing. The last time he had tried the stunt was on another line, when, because there had been no easing up of the speed, he had missed in his prod the side of the other basket and put the point of his alpenstock through one of the round holes in its sheet-iron bottom. Result: the loss of his alpenstock, and very nearly that of his balance and his life.

A Critical Moment in a Trip up an Adamello Teleferica during a Gale Which Caused the Wires to Swing from 15 to 20 Feet: Were the Ascending and Desending Baskets to Strike Each Other, the Passengers would be Lost. The Drawing Shows How the Guard Prevented This

All sorts of freight—from ducks and donkeys to shells and cannon—have been carried by the *teleferica*, and one of the best stories I heard on the Italian front had to do with a pig—the mascot of a battalion of Alpini holding a lofty position on a Dolomite glacier—which found its way up there by the cable-way. He was a suckling pig in the first place, and was being sent up alive to be "barbecued" for the major's Christmas dinner, when the *teleferica* basket in which he was traveling got stuck in a drift which had encroached upon one of the steel towers. Twelve hours elapsed before it was shoveled free, and the suckling pig which finally reached the top was frozen as hard and stiff as one of his cold-storage brothers. Indeed, one of his ears was cracked off when an irreverent *aspirante* tried to beat a tattoo with his unprotesting anatomy on the table. It was only after he had laid in the hot kitchen for several hours and finally—as a preliminary to removing the bristles—been thrust into a pot of hot water that an indignant grunt revealed the astonishing fact that an armor of fat had kept smoldering a spark of life all the time. They reared him on a bottle, and at the time I saw him he was a hulking porker of two hundred pounds or more, drawing a regular ration of his own. They called him *Tedesco* [German]—on account of his face and figure rather than his disposition, they said—but all the same, I would be willing to wager that, if that brave battalion of Alpini were able to save anything more than their rifles and their eagle plumes in their retreat, he was not allowed to fall into the hands of his brother *Tedeschi* from the other side of the Alps.

The expedient of shooting a *teleferica* cable across an otherwise unbridgeable space was not tried for the first time when it was resorted to in running a line across a flood-swollen river.

Demolishing an Austrian Base in the Alps from a Teleferica: The Austrians, with a Few Machine Guns, had Made the Italians Holding an Another Peak Uncomfortable for Some Time. After the Austrians had Failed, a Bold Italian Captain from the Basket. This Idea Proved Successful, and Effectually Put Out

The same plan had also been successfully followed a year previously in carrying succor to a band of Alpini who, through the destruction of their *teleferica* by an avalanche, were left marooned on the side of a glacier with only a few days' supply of food and munitions. The one path leading up to their aerie had also been scoured away by the slide, so that a month or more of labor would have been required to open communications in this way. For the same reason even a longer period would have had to elapse before the *teleferica* could be restored; that is, if the cable were to be carried up as when it was first built. The mountaineering genius of the Alpini would undoubtedly have been equal to the problem of finding their way back to safety by letting each other down by ropes, but this would have involved the abandonment of a position which it was vitally important to hold.

The expedient of shooting the cable up from a gun was the only one of the many alternatives considered which promised any chance of success. The first attempt nearly proved a "boomerang," for the weight of the cable deflected the chargeless six-inch shell to which it was attached nearly 60° and sent it crashing through a mule stable, fortunately empty at the moment. A shell attached to a lighter cable went almost equally wide of its mark; in fact, all attempts with high-velocity guns were dismal failures, and it was not until one of the new long-range trench mortars was brought up that the experiment took an encouraging turn. The heavy slow-moving, high-trajectory projectile of this latter weapon was far less affected by having to carry a "passenger" than the spinning shells, but even so it was not quite equal to the task of lifting even the lightest length of cable to an eminence half a mile distant and a thousand feet above. Ultimate success was not won until a light Manila-hemp line was secured. This

was fired to its goal in the very first attempt.

Perhaps the most spectacular exploit ever carried out from a *teleferica* was that by which a troublesome nest of Austrian machine gunners were cleared off one of the pinnacles of the great M. *massif* in the fall of 1916. At this time that lofty ridge was divided between the Italians and Austrians. The latter had access to one splintered pinnacle which, although there was no room to establish a permanent position there, offered a splendid vantage point from which to observe all the movements in the valley beneath. The situation was irritating enough for the Italians even when the activities of the enemy were confined only to observation, but when he took to bringing up a machine gun and peppering—almost from its rear—the headquarters of an Alpini battalion which held an important pass 3,000 feet below, it became well-nigh intolerable. What happened was related to me some months later, when I asked the major of this battalion how it chanced that the roof of the officers' mess in which we were dining, was armored with sheets of steel.

"Against machine-gun bullets," was the reply; "there was a time—of accursed memory—in which he used to bring a gun out on a little splinter of rock, not 1,500 meters from here in an air line, and spray the whole of our little terrace with 'dumdums.'"

"We were working day and night," he continued, "to excavate a gun cavern, the fire from which would make that troublesome position untenable for the Austrians. In the meantime we had to stick it out as best we

Important Pass on Several Plans to Dislodge Proposed Peppering Them the Austrian Guns were of Business

could, for the least weakening of our force at this point would have been the signal for an Austrian attack which might well have left them in possession of the pass. By doing most of our moving about at night, we were getting on fairly well, until, opening up at an unexpectedly early hour one morning, they killed a good many more of us than I like to think of.

"It was at this juncture that Captain X over there, who had just had a bullet through his hat, came to me with a drawing in his hand, and said that he had just figured out that, between the third and fourth towers of the *teleferica*, there was a point from which the Austrian machine-gun position could be enfiladed with deadly effect.

"'Enfiladed with what?' I scoffed. 'No doubt you could enfilade it from between the third and fourth stars of Orion's Belt—if you could get a gun up there.'

"'But what is to prevent my rigging up a machine gun in a *teleferica* basket, covering it—with myself and a man to help—under a piece of canvas as if it was an ordinary load of gear, letting it be run down until I am well in the rear of the Austrians, and turning loose?'

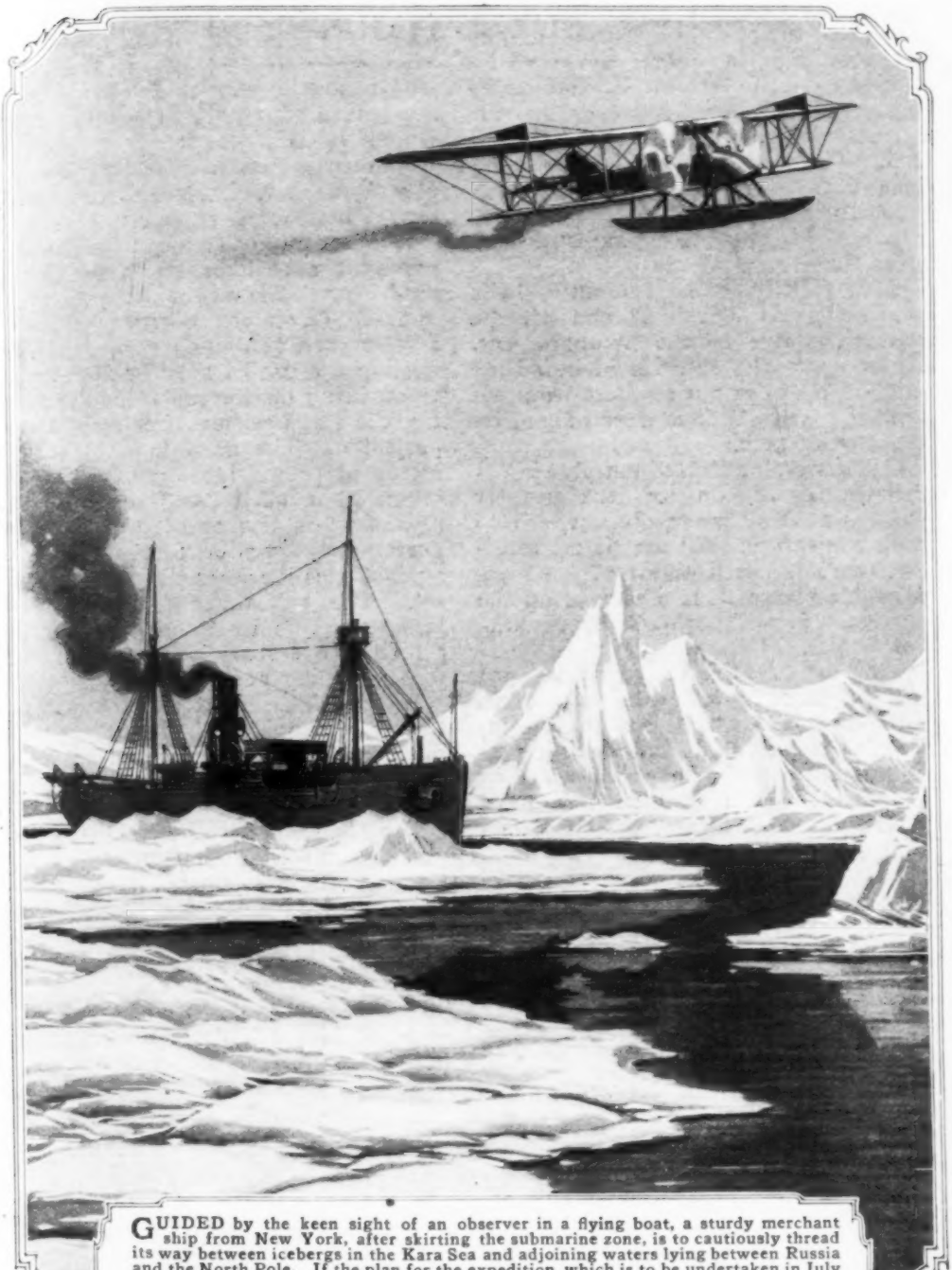
"If I hadn't been seeing more or less red myself, and if our position had not become really serious, I would probably never have listened to the mad proposal. As it was, I entered into it heart and soul. We reckoned the slope of the cable, and hung the platform of the machine gun at an angle which would make it easy to elevate and range on the Austrian position above. Then—as a happy afterthought—we bent a sheet of bullet-proof steel for a shield on the exposed side, erected a low platform on which the gun would rest securely and—the first and last armored *teleferica* was complete. Between X and his helper, the armor and the gun, the weight was about double that which the *teleferica* was supposed to carry, but I knew there was a wide margin of safety allowed for, and had no misgivings on that score.

"There was about a hundred meters of cableway running up to the station which, lying in the lee of a big snowdrift, was out of range of the Austrian fire, and here we had our 'launching' and 'trial trip.' For good luck, I broke my last bottle of *Asti spumante* [sparkling Asti wine] over the nose of the machine gun at the former function. We had to do a bit of 'trimming' to put her on an even keel, after which she rode smoothly and evenly. With X and his assistant crouched low on either side of the gun, and with a black tarpaulin thrown loosely over the whole, she looked as much like an ordinary load of junk going down for repairs as anyone could wish, and—which was really more than we dared hope—our camouflage completely fooled the enemy.

"The Austrians, who had been busy for an hour peppering the zigzags of the path up to the trenches at the lip of the pass, took no notice of the innocent-looking load slipping down the *teleferica*. The relieved men from above, dodging in quick rushes past the exposed stretches of the zigzags, offered them far more exciting practice than a load of old gear. The latter disappeared from our sight at the second tower, reappeared at the third, and was in full view when X 'unmasked' and opened up. We could even follow the line of brown-dust spurts on the face of the cliff as the bullets ranged upward to their mark. And that was about all there was to it. The fire of the two Austrian machine guns ceased instantly, and never resumed. Probably the gunners were killed before they had a chance even to turn round their guns and reply to the sudden attack from the air.

"After spraying the pinnacle for five minutes, X signaled to be drawn up. He arrived at the station to report his job finished. Against possible further use for her, we improved our 'aerial dreadnaught' considerably in the next day or two, but there was never occasion to send her into action again. When the Austrians did venture up, our big gun was in place, and we scoured them off the top with high explosives."

AIRMAN A PILOT FOR SHIP IN ICE FIELDS



GUIDED by the keen sight of an observer in a flying boat, a sturdy merchant ship from New York, after skirting the submarine zone, is to cautiously thread its way between icebergs in the Kara Sea and adjoining waters lying between Russia and the North Pole. If the plan for the expedition, which is to be undertaken in July by a trading company, is realized, it undoubtedly will be the first time that a flying boat has been employed in arctic regions as a route finder for a merchant ship. The destination of the vessel and its aerial pilot will be a trading post near the Ob and Yenisei rivers in northwestern Siberia, to which merchandise for the inhabitants of the region is carried annually. It is believed an airman in a flying boat would find no difficulty in starting from and landing on arctic waters and his ability to see far down into the water when flying should prove invaluable in selecting a path for a vessel through treacherous ice fields.

LONG-DISTANCE GUNS SHELL PARIS

LONG-RANGE guns are bombarding Paris as this is written. Shells hurled from the forest of St. Gobain, 76 miles distant, are bursting in the streets and environs of the French capital. The inconceivable has been accomplished. The Germans have made good their two-year-old boast of a gun capable of laying waste English towns from Calais.

Some fifty-one 9.5-in. shells reached Paris March 23 and 24, the first two days of the bombardment. Almost as many theories of how they might have been hurled there from behind the German lines were offered on the twenty-fifth.

Obviously, for lack of tangible information, discussion of the master weapon at this time resolves itself into rank conjecture. All that is appropriate, therefore, is a digest of the most plausible suggestions advanced on the strength of hastily cabled advices without details.

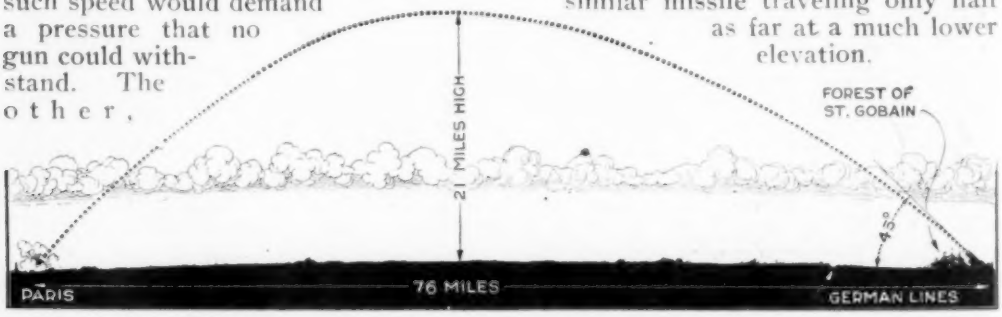
Thus far (the third day of the siege) two or more guns have been used. This is indicated by the 20-minute intervals between shots and also the plural number used in the official German statement, which reads: "We have bombarded the fortress of Paris with long-distance guns."

As to the character of the gun, we have the analyses of two ordnance authorities who contend that a 76-mile piece would have to hurl a projectile at a muzzle velocity of from 5,000 to 7,000 ft. a second. Here the men part company, one of them contending that such speed would demand a pressure that no gun could withstand. The other, however, continues by estimating that the piece has a barrel about 119 ft. in length and arguing that it necessarily must have been built at the spot from which it is fired. Such a weapon would require a foundation like that of a skyscraper. Its barrel would need heavy, permanent supports.

Another authority advances the theory that subcaliber shells are being used. By this is meant that projectiles of 9.5-in. diameter are held by rings to a false shell of double size, thus permitting the use of a 19 or 20-in. gun. Upon being discharged from the muzzle, the rings release, freeing the real projectile. The advantage of this is increased propulsive force. The base of an 18-in. shell has four times the area of a 9-in. one, and therefore a proportionately greater force is exerted against it as it passes through the barrel. The subcaliber plan reaps the benefit of this by temporarily giving a shell an oversized base against which the expanding gases exert themselves.

A French scientist propounded the theory of tungsten shells. Projectiles made of this element would have the same weight as steel ones of twice as great caliber.

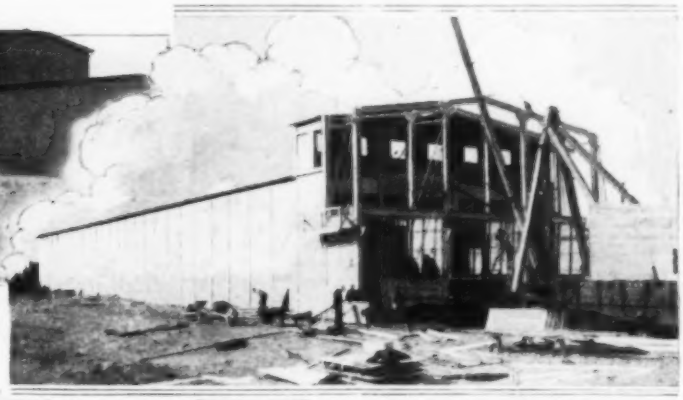
If a shell fired by the new German gun ascends at a 45° angle and follows a normal trajectory, it reaches an altitude of 21 miles or more. Thus a large part of its travel would be through a highly rarefied atmosphere that would offer little resistance. In its whole course it perhaps would not be retarded much more than would a similar missile traveling only half as far at a much lower elevation.



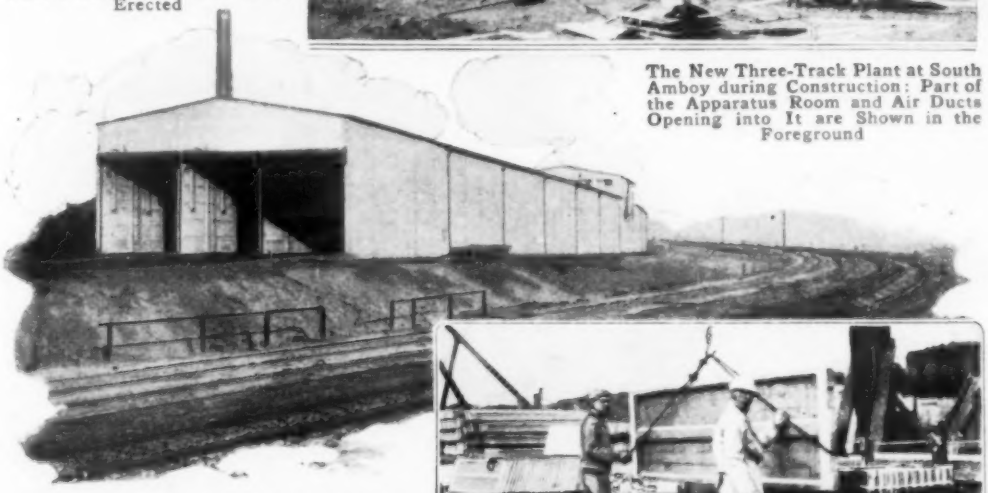
Following a Normal Trajectory, as Shown Above, the Shells Hurled into Paris from the Forest of St. Gobain must have Reached an Altitude of 21 or More Miles and Traveled Much of the Distance through Highly Rarefied Atmosphere. This, Perhaps, Partly Accounts for Their Range

BIG HEATING SHED THAWS CARS OF FROZEN COAL

Two-Track, 500-Foot Thawing Shed of Wood Construction, the First Plant of Its Kind to be Erected

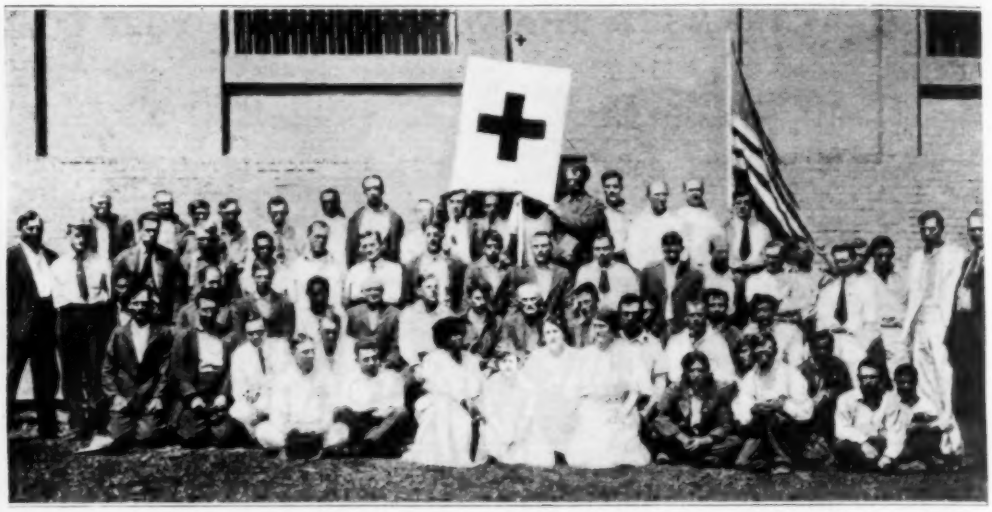


The New Three-Track Plant at South Amboy during Construction: Part of the Apparatus Room and Air Ducts Opening into It are Shown in the Foreground



The Coal-Thawing Shed after Completion: Its Capacity Is About 42 Cars an Hour. Right: The Concrete Panels Used in the Construction of the Walls and Partitions of the Big Shed

During the severe part of the past winter when the fuel shortage became critical, a coal-thawing plant at South Amboy, N. J., performed valuable service in relieving the situation. In particularly cold, stormy weather it is often the rule, rather than the exception, that coal reaches northern cities in such solidly frozen masses that it has virtually to be mined out of the cars. The past winter was especially favorable for this condition and thousands of tons of fuel destined for New York reached Jersey badly bound with ice. Many such coal trains were thawed at South Amboy. The new plant there consists of a long concrete shed divided into three longitudinal chambers, each of which spans a separate track. Steel doors close the ends of the passages, while the space between the ceiling and the peaked roof is occupied by air ducts. These extend from the middle or elevated section of the building, where powerful blowers and steam coils are installed. The hot air circulated from there is conveyed to the three thawing chambers and blown against all sides of the frozen cars. The plant accommodates 42 standard cars at a time. An hour's confinement in the heating room suffices to thaw out the frozen coal so it can be dumped without difficulty.



INMATES OF STATE PRISON HAVE RED CROSS BRANCH

THIS group belongs to one of the most noteworthy Red Cross auxiliaries in this country, for its membership is composed of inmates of Oregon's state prison. The 339 members' genuine loyalty to their country is a fine commentary on the state's humanitarian method of dealing with law breakers. The auxiliary has given $465 to the Red Cross and has subscribed $2,000 in Liberty bonds. The president, a man serving a life sentence, stands at the extreme right. The four women in the group are the only ones committed to this prison.

STABLE HIDDEN FROM VIEW IN SIDE OF BLUFF

Stables and stable yards halfway up the side of a steep bluff are an unusual feature of a western home overlooking the Pacific. Desiring to have the quarters for his horses out of sight, the owner of the establishment made a terrace in the side of the bluff on which the house stands, fencing in the level ground and excavating rooms in the adjoining hillside for a stable. From the residence an unobstructed view of the ocean is obtained, there being no indication that the horses are so near at hand.

Corral for Horses in Side of a Bluff Overlooking the Pacific: The Stables are Excavated in the Side of the Slope

SUBSTITUTE FOR LEATHER UNHARMED BY WATER

The extremely high price of leather has been a factor in producing a new substitute which is already being used extensively in making workingmen's gloves, and other articles, and is proving to be more durable than the split leather used for that purpose, it is claimed. The new material has a base of strongly woven cotton fabric, on one side of which is a heavy nap that takes the place of a lining in a glove. The other side is finished with a pliable coating that is impervious to grease and dirt. Unlike leather, this substitute does not harden after being wet, but dries soft and pliable.

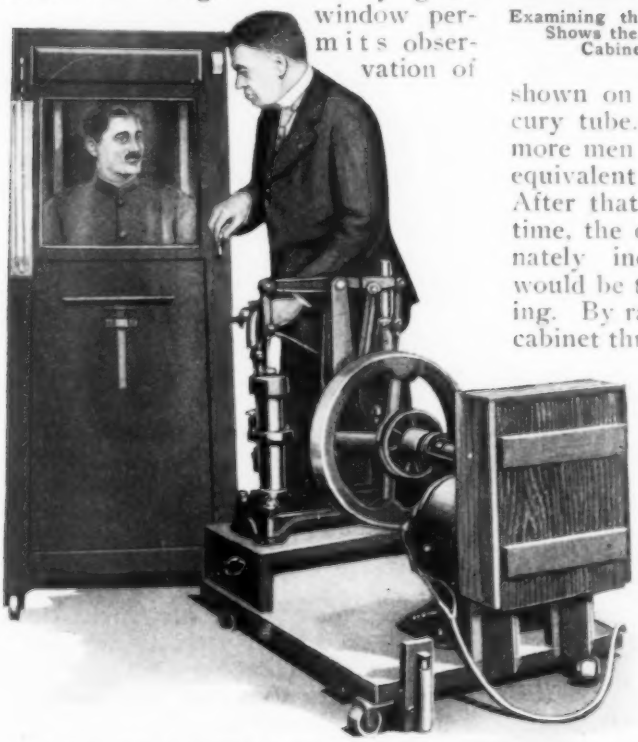
NEW TESTS REVEAL FATAL DEFECTS IN FLIERS

By JOHN ANSON FORD

THAT a startling percentage of men now being accepted for air service have hidden physical weaknesses that may prove their undoing, is indicated by new scientific tests that have been made on a large number of newly enlisted airmen. These tests, which reveal so much of vital import for our armies, have been made by a Chicago specialist, Capt. Charles Moore Robertson of the Medical Reserve Corps, who has fitted up for the purpose a cabinet in which each flier-to-be was placed and subjected to atmospheric conditions identical, so far as pressure is concerned, with those obtaining in flying, the air being rarefied by means of a powerful pump.

The cabinet used is of steel, and when locked is air-tight. A heavy glass window permits observation of the subject within. The rapidity of the "ascent" and the altitude simulated is shown on a properly graduated mercury tube. Each of the hundred and more men tested was subjected to the equivalent of an altitude of 6,000 ft. After that had been maintained for a time, the density of the air was alternately increased and decreased as would be the case in actual maneuvering. By rapidly letting the air into the cabinet through a cock the subjects underwent the equivalent of a swift nose dive of a mile—a feat that is a severe strain on many men.

Examining the Graduated Mercury Tube Which Shows the Atmospheric Pressure within the Cabinet, and the Altitude Simulated

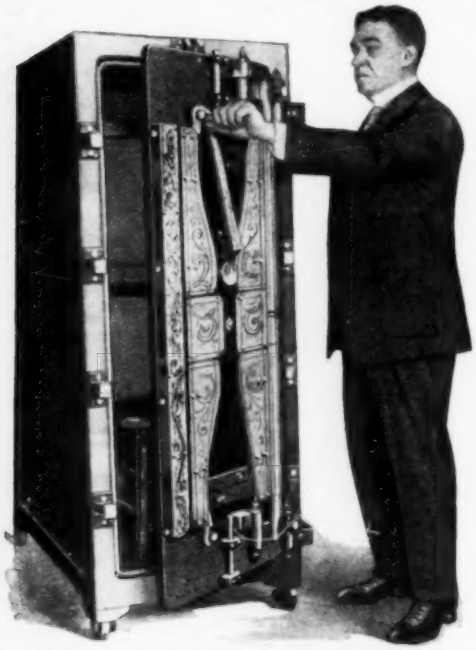


The Cabinet and Powerful Pump with Which the Tests were Made: By Turning the Cock under the Operator's Right Hand the Subject is Made to Experience the Equivalent of a Nose Dive

Each man was examined both before and after being confined in the cabinet, each examination consisting in taking the blood pressure, ascertaining the muscle tone by measuring the duration of one nerve impulse with a dynamometer and stop watch, and in revolving the subject in a pivoted chair.

The records show that the first examinations gave no indication of the

condition that would exist after the "flight," over 25 per cent of the men proving unfit, according to these tests. For this reason, it is strongly contended



Opening the Powerful Door of the Steel Cabinet in Which Each of the Airmen was Placed in Turn

that a most serious mistake is being made in accepting men for air service merely on the basis of a physical examination made without taking into account the effect of sudden changes of air pressure.

The Dynamometer Used in Testing Muscle Tone

Limited investigations with the aid of a vacuum chamber have been made in one of the eastern flying camps to show the degeneration resulting in experienced airmen due to lack of oxygen while flying at great altitude. There is every reason to believe that the experienced men who have been found unfit by these tests, would have been detected in advance had an examination of this nature been made at the time they were accepted for service.

Some men who appeared the best physical types showed the most signs of shock and ear disturbances after emerging from the specialist's air-tight chamber. In many cases the ear sense seemed almost obliterated—a condition often involving the gravest consequences for a flier and those dependent on him. In other cases fellows who looked a poorer type seemed to improve from the experience, the ear, for example, being more acute in its sense of equilibrium after the "flight."

SORTING MACHINE REDUCES COST OF HANDLING MAIL

Speed, accuracy, and economy, the prerequisites of efficiency in the mailing divisions of our big post offices, are raised to a new high level by a remarkable mail-sorting and assembling apparatus that has of late been developed. Until recently it has been necessary to do all of this work by hand. With the machine, which in handling first-class mail serves about the same function as does the linotype in the printing industry, labor is reduced about 50 per cent, and an actual money saving of 30 cents per thousand letters effected. The importance of such equipment in an office where from 3,000,000 to 5,000,000 letters are handled daily, as is the case at Chicago, can well be imagined.

One of the units consists of 10 independent distributing machines operating in conjunction with an endless conveyor, nearly 100 ft. in length. It is equipped with 1,500 separate carriers which take the letters from the distributing machines and drop them into their respective cases, of which there are 256 arranged along the bottom of the apparatus. Each of the distributors is controlled by a board supplied with 69 keys, capable of 256 distinct operations. It is through their use that the button setters, devices that set the selectors on the carriers so that they will discharge letters at the proper points, are actuated.

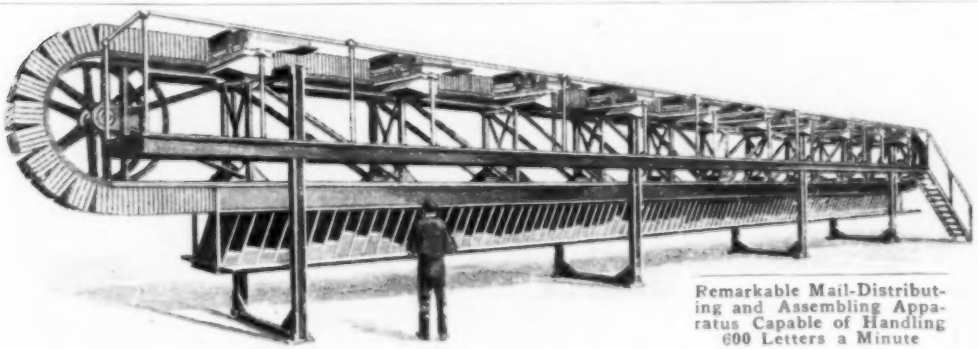
Conveyors bring letters direct from the canceling machines to feed tables, where power-operated chains move them into the reading positions before

Operating in the Chicago Post Office: This Small Model of the Big Machine Shown Below was Given a Year's Trial Under Actual Working Conditions for Experimental Purposes

the operators as rapidly as the latter can dispatch them. A separator at each of these places, embodying the essential principles of the canceling machine, counts and records the number of letters handled, and imprints on each a character identifying the operator. When sorted letters are removed from the cases, they are conveyed to machines, installed at one end of the apparatus, where they are "tied out."

Thus, in one operation, 256 separations are possible. The practicality of the machine has been demonstrated at the Chicago post office, where a model, with a single keyboard, was used experimentally for about a year. It is estimated that 13 machines would meet the present requirements of that office.

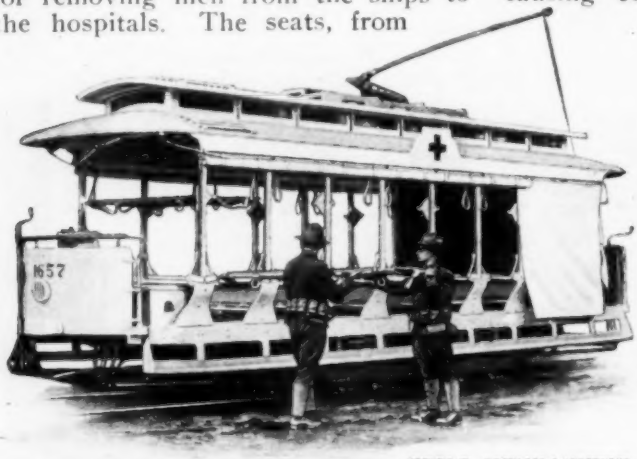
¶ In Canada attention has been turned to ways of fittingly recognizing the country's dead when peace quiets the battle fields of Europe. Among other things it is proposed that a bronze maple leaf on a granite base be used to mark the grave of every fallen soldier of the Dominion. The maple leaf is the national Canadian emblem.



Remarkable Mail-Distributing and Assembling Apparatus Capable of Handling 600 Letters a Minute

STREET CAR EQUIPPED AS ARMY AMBULANCE

In anticipation of the arrival of many wounded from Europe, an old-style open street car in Boston has been equipped as a double-deck ambulance for removing men from the ships to the hospitals. The seats, from which the backs have been removed, serve as supports for one layer of stretchers, while loops, fastened near the roof, support a second layer.



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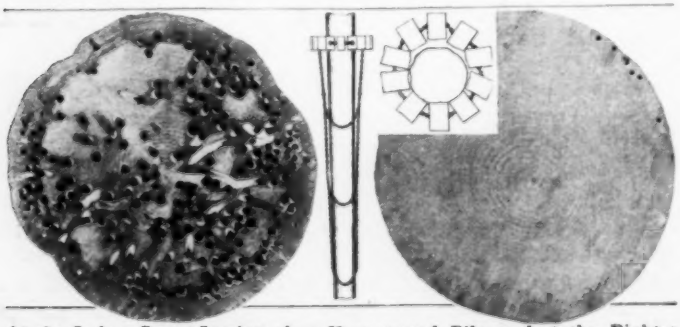
Old-Style Street Car Altered and Equipped to Serve as an Ambulance to Carry Wounded Soldiers from Vessels to the Hospitals

PLAN ONE SET OF ENGINES FOR FIVE SHIPS

Detachable engines for ships engaged in cross-channel and coastwise traffic are advocated by a British engineer. The novelty of the scheme is causing comment in marine circles. The proposal has for its foundation the fact that vessels which spend only a few hours in crossing the English Channel usually remain in port five or six days. Because of this, their expensive power plants are in actual use only a small part of the time. By the inventor's plan one set of engines would be made to drive the electric motors of from three to five different hulls. They would be mounted in a steel caisson, containing the engineer's quarters, which would be fixed at the stern of a ship. Upon reaching port the caisson would be removed from the newly arrived vessel and transferred to one ready to depart.

PILES PROTECTED BY BLOCK BELTS AND CHAINS

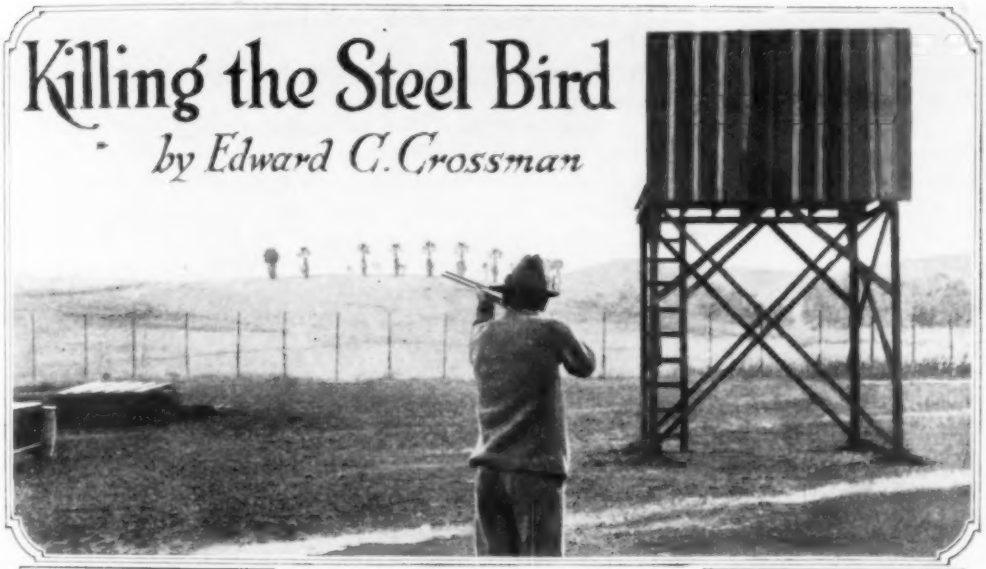
To protect the timber piling of wharfs, piers, docks, and bridges in salt water from the ravages of wood-gnawing and boring worms, such as teredos, a buoyant belt and chain contrivance has been tried out with apparent success. It consists of a loose belt of connected wood blocks that encircles a pile and has appended to it looped chains that extend to the mud line at low tide. The action of the waves keeps the blocks constantly battering and rubbing up and down against the sides of the pile from the low to the high-tide levels. At the same time the chains are raised and lowered by the tides so that they also continually scrape the pile and help to keep it free from marine growths and wood borers.



At the Left a Cross Section of an Unprotected Pile, and at the Right a Similar View of One Supplied with the Belt and Chain Device, after Eight and a Half Months' Exposure in San Francisco Bay: The Diagrams Explain the Character and Method of Application of the Contrivance

Killing the Steel Bird

by Edward C. Crossman



Blazing at the Fleet Steel Bird, Visible in the Upper Left-Hand Corner below the Tail of the "K"

Close View of the Shot-Specked Target, Showing How It Hangs After being Hit

FROM the covert of the brown wooden shelter perched on its 16-ft. legs there suddenly darted into the ken of the waiting sportsman, a ghostly sort of a white bird. Horizontally, as straight as an arrow and nearly as swift as one, it sped across the space to another tower a hundred feet or more away.

The double flew to the

Starting the Bird on Its Swift 40-Yard Flight along the Wires between the Towers

This Picture Is the Companion of the One at the Top and Shows the "Dead" Bird Hanging by Its Beak While being Pulled to the Shelter to be Reset for Another Flight

shoulder of the marksman, light-blue vapor puffed from the muzzle, the nitro cracked sharply. Promptly the white bird ceased its level gliding, it fell straight down six inches or more, then it dangled in unbirdlike fashion at the end of a rod to which its beak was fastened.

Again the marksman closed the gun on a fresh cartridge and stood ready. That was easy, he told himself; all you had to watch for was the white bird, dove-size and shape, darting out from the shelter of either of the board partitions.

Only it didn't. Ten yards past the line of the two towers, and about midway between, there lay an unnoticeable little wooden house over a pit in the ground, with house roof hardly two feet from the surface of the earth. As between the two towers, very fine, nearly invisible wires ran from the pit to each of the towers.

Instead of the horizontal dart of bird from tower shelter, there suddenly leaped from the little house on the ground either the selfsame bird or one much like it. Upward, across the line of fire, and toward the shooter, it moved, a combination of pace that would puzzle the most expert. The bark of the double produced nothing but jeers from the spectators, the white bird hastily darted into the shelter of the left tower partition, and disappeared.

So a fresh victim became introduced to the brand-new game of the steel pigeon as just installed at a Los Angeles gun club. Devoid of the expensive, penny-a-shot clay birds or disks, and adapted to the smallest guns throwing shot, the new game is the Hoover game of the shotgun lover. It costs only the shells—and they can be reloaded and as light as one pleases in shot charge.

The installation of the steel pigeon is simple. First, there are two wooden platforms, 16 ft. from the ground, with a wooden shot-proof wall on the side toward the firing line, and a rail on the other sides. Ten yards farther out and about midway, there is dug the pit with the little wooden house over it for shelter.

The moving mechanism for the bird is merely a grooved pulley wheel, a foot or so in diameter, geared to high speed from a still larger wheel with a hand crank on it. In each tower there are two such driving pulleys with their gears, one in each tower for the flight from tower to tower, one for the flight to and from the pit. There is another driving set in the pit.

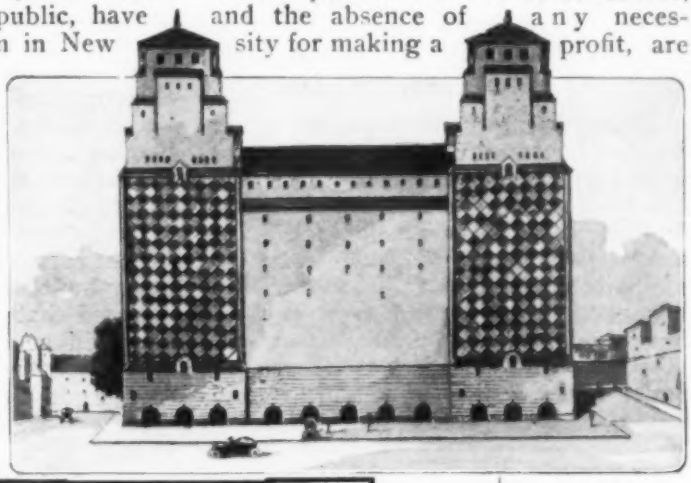
Very light piano wire is attached in endless fashion from the carrier on which the bird is fastened, to the wheel, over it and back to the bird, so the turning of the pulley carries the wire with it as the festive apartment-house clotheslines bring in the clothes to the cleanly housewife. The wire is made very light and nearly invisible to give as nearly a lifelike appearance as possible to the bird's flight. Sets of the wires run between the towers, and from towers to pit.

A little steel case, that normally lies within the hollow body of the bird, contains a catch to hold the bird to the box, and in normal flying position. There is a trigger to release this catch and let the bird drop the instant it is released, and the wings, hinged and easily moved, connect with this trigger. Hit a wing with so much as a pellet of shot, and it drives inward, trips the trigger, releases the steel bird, and it falls, to dangle helplessly and very "dead," in appearance, at the end of a swivel rod which is fastened to the bird's beak. Then the trapper runs it on into the shelter, turns the bird around on this pivot rod, snaps the body around the little steel trigger box so the trigger engages in the body, then starts it on its return trip.

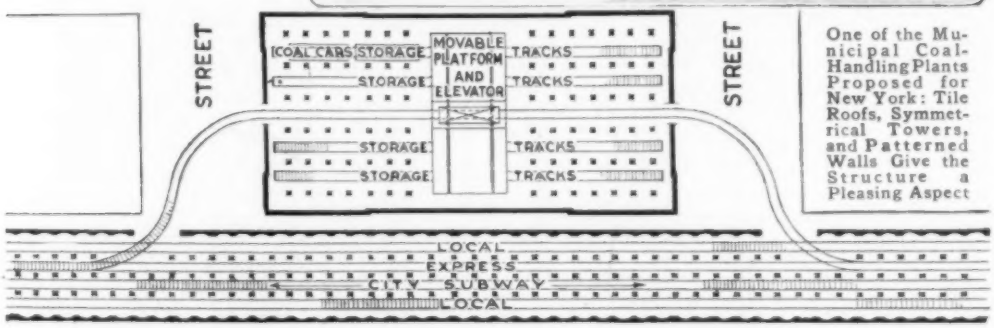
If the towers were farther apart, there would be no trouble in getting up the speed of the fastest duck, so light is the apparatus, and so highly is the pulley geared up from the drive wheel. The 40-yd. distance between towers prevents getting up or stopping such high speed, but the trip over the 40 can be made in little more than two seconds, or good upland-bird speed.

MUNICIPAL COAL-HANDLING PLANTS PROPOSED

Municipal coal-handling establishments which, it is claimed, would effect a great saving to the public, have been proposed by a firm in New York following the recent coal shortage, during which some of the possibilities of government control of fuel were revealed. As a suggestion, plans have been drawn for a typical plant which would be connected by rail with the subway, and so make cheap transportation possible by utilizing the underground lines during the quiet hours of the night.



One of the Municipal Coal-Handling Plants Proposed for New York: Tile Roofs, Symmetrical Towers, and Patterned Walls Give the Structure a Pleasing Aspect



Basement Plan of One of the Proposed Coal-Storage Plants for New York City: Coal Cars would be Switched from the Subway Express Tracks during Hours When the Latter Are Not in Use and Placed onto the Movable Platform, Whence They would be Elevated to the Top of the Building and Dumped

The plans of the proposed building, a duplicate of which would be erected in each of several districts in the city, provide for a structure 100 by 200 ft. and as high as a 20-story building. The basement is on a level with the subway and connected with it by a switch track. Loaded coal cars would be placed on a large elevator and raised to the top of the structure, where they would be unloaded by gravity into the proper bins. Trucks or wagons drawn beneath chutes located at street level could be filled very quickly. Those proposing this rather radical departure in the method of handling coal point out that the use of transportation lines already in existence, the large scale on which operations would be conducted, and the absence of any necessity for making a profit, are factors that would make probable a large reduction in retail prices.

SIMPLE ANGLE INDICATOR FOR VARIOUS PURPOSES

Of possible interest to carpenters and mechanics is an automatic angle spirit level, lately devised, that accurately measures degrees of inclination. It consists of a spirit tube attached at right angles to an indicator hand, the top of which is pivoted at the center of a semicircular disk provided

with graduations. Since gravity keeps the pendulum in a perpendicular position, the bubble serves merely to check the accuracy of the instrument.

ARMY BLANKETS TOO STIFF FOR MODERN NEEDS

That the present type of army blanket is too stiff and hence does not afford as much warmth as it should, considering the material used, is claimed by an eastern health official. The radical changes that have come in methods of warfare, it is pointed out, dictate that a different type of bedding should be used. The present bed-covering for soldiers was originated when fighting was in the open and the men were marching and countermarching almost daily. Then it was necessary to have stiff, tough fabric to withstand the severe wear. More acceptable today, it is urged, would be a softer covering, for economy as well as comfort would be served thereby. It is claimed that three softer blankets are as warm as five army blankets, due largely to the fact that the former fit snugly about the body and so do not let the warm air escape.

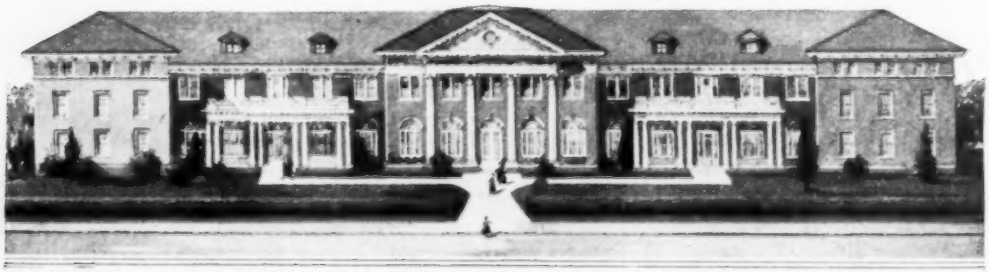
¶The management of a hotel now being built in New York City has announced that on the roof of the structure will be constructed hangars and other conveniences for airmen who are its guests.

FIRM BUILDS FINE HOME FOR GIRL EMPLOYES

Confronted by large losses due to the number of girl employes that are not content to remain long in one town, a Virginia cotton-mill concern is now investing $150,000 in an effort to make the young women more contented by giving them attractive living quarters. The money is being used to build a handsome dormitory on a sloping site that allows three stories above ground on one side and six stories above ground on the other side. A subway connecting with the textile mill will prove a convenience in wet weather.

Two of the 12 Parlors Where Girls may Entertain Their Friends: Glass Partitions Separate the Small Rooms from the Reception Hall

Novel arrangements are being provided for the entertainment of male company by the



The $150,000 Home for Girls Employed in a Cotton Mill: Among Its Special Features will Be a Gymnasium, Swimming Pool, and Classrooms

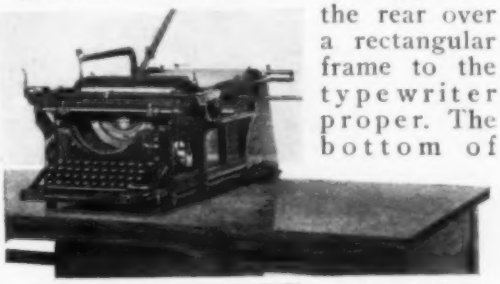
girls. On the second floor is a large reception hall surrounded on three sides by small parlors, 12 in all, each having a glass partition between it and the central room. Couples desiring more privacy than can be had in the reception hall, where a chaperon will be stationed, can obtain it in the smaller rooms. The young women will all eat in a large dining hall. Other attractive features will be the gymnasium, swimming pool, sun parlor, conservatory, and classrooms for teaching millinery and dressmaking. Giving as it does some phases of the life enjoyed by girls at boarding schools, it is thought the home will meet the situation.

AIRMEN AWAIT PERFECTION IN AERO INSTRUMENTS

Our airmen and those of our allies are in need of three aeronautic instruments, of which no practical and reliable forms have been found, although many have been invented. Each of them presents problems complicated by technical difficulties that can theoretically, but not easily, be overcome. To be concrete: Pilots lack an instrument capable of indicating with accuracy the position of a craft when it is flying in clouds or darkness. In the interests of safety and successful operation, such a device would be of incalculable value at this time. There is need for a thoroughly reliable vertical indicator; one that will function trustworthily at all times, regardless of the position assumed by an aeroplane. A device that indicates how fast a plane is rising or falling would also satisfy a keenly felt need. The first instrument could not be dependent upon any contrivance for observing drift, and the second could not be a gravity device. The first and third problems are more or less related and the solution of one of them therefore might solve also the other.

BILLING MACHINE SAVES OPERATOR'S TIME

The use of a new billing machine with which an original and eight duplicates can be made, saves much time usually occupied in handling carbon sheets. Wide paper, several yards in length, and folded lengthwise to make the desired number of duplicates, is used in this machine. It is fed from the rear over a rectangular frame to the typewriter proper. The bottom of each carbon is held in a clamp and after the sheets are inserted between the folds, the clamps are rigidly anchored to a carriage on the rear frame. When a bill has been written, the operator releases the mechanism holding the paper against the platen and draws all the carbon sheets at one time into a new position merely by pushing the carriage backward on the rear frame. The bill and its duplicates are then torn off.



With This Billing Machine Carbon Sheets Once in Place RequireNoHandling While a Large Number of Bills are being Made Out

Rear View Showing the Special Paper Used and the Frame Supporting the Carriage to Which the Carbon Sheets are Fastened

GIRL IS ABLE REPAIR "MAN" FOR PHONE COMPANY

When the automatic telephone switchboard in Santa Monica, Calif., gets out of order it is an athletic young

Perhaps the Only Girl in the Country Who Climbs Telephone Poles, Replaces Wires, and Repairs Switchboards as Efficiently as a Man

woman, clad in overalls and jumper, that "shoots the trouble." Before this high-school graduate of unusual accomplishments obtained her present position of indoor telephone mechanic, she proved herself as efficient as the men in doing line work, climbing poles and replacing wires as readily as any of them. But for the war and the shortage of men having mechanical experience, she probably would not be filling a man's place. However, being fond of mechanics and having a knowledge of electricity, she intends to remain at her post until peace comes, and then get a college education.

BROWNING GUNS SHOW WORTH IN TESTS

For the benefit of the general public, demonstrations of the Browning machine gun and automatic rifle, which our boys are to use against the Huns in France, have been made at Washington before correspondents and members of congress. The machine gun, it develops, is a water-cooled piece operated by the recoil. It can be operated both automatically and semiautomatically, and is capable of firing 500 shots a minute. It is used with a tripod, and weighs, with the water jacket full, 34½ lb. When modified in certain ways and stripped of its water jacket, bringing its weight down to 22½ lb., it is suited for aeroplane use.

Particularly worthy of note is the simplicity of its construction, which is of importance in the interest of large-quantity production and satisfactory field service. It is fed by a cotton belt containing 250 rounds of service cartridges. Both the machine gun and the automatic rifle use the same ammunition—.30-caliber, rimless, cupro-nickel bullets—taken by the Springfields and modified Enfields with which our soldiers are equipped. The machine gun in one test fired 39,000 shots without interruption. Another fired 20,000 shots in 48 min. and 16 sec. with three stops and a malfunction due to defective cartridges.

The automatic rifle is known as the "Light Browning" and hasn't a single complicated piece of mechanism. It is gas-operated, air-cooled, and weighs 15 lb. It is fired from the shoulder like an ordinary service rifle, which it resembles, or from the hip. Its magazine, which contains 20, or for certain purposes 40, shells, may be detached or replaced by a fresh one in two and a half seconds. It has less than 20 principal parts of mechanism, is thoroughly standardized, and it therefore has the advantage of being easily taken apart or assembled quickly.

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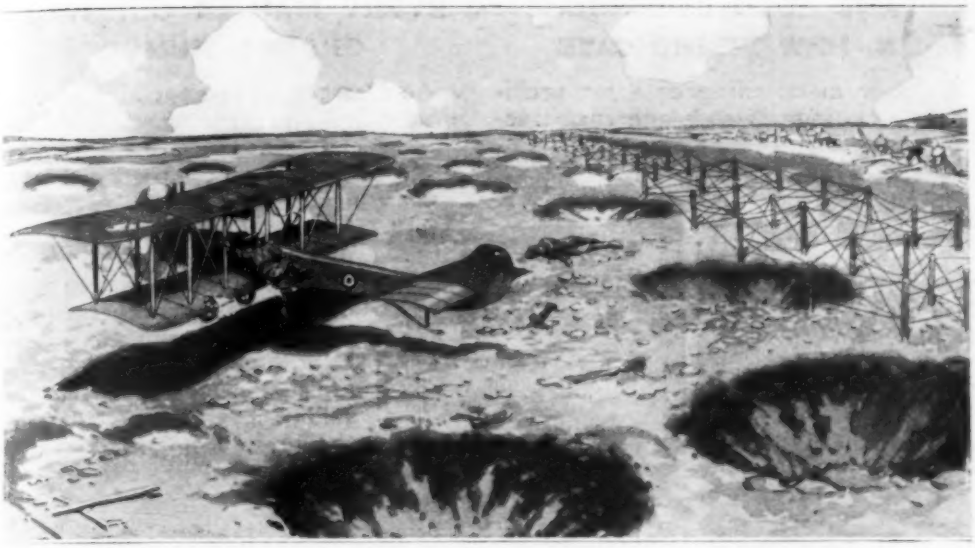
Thirty-Nine Thousand Shots without Interruption Is One Casual Record Made by This Browning Machine Gun in Tests Conducted at Washington Recently



FLIES UNCONTROLLABLE PLANE OUT OF "NO MAN'S LAND"

HERE is a good index to the courage of the young Britishers who compose the Royal Flying Corps. To save a crippled biplane that had fallen in "No Man's Land," Lieut. Cuthbert D. Fellowes crept 300 yards, in full view of the enemy, to the machine. When he started the engine the craft swept over his body. He sprinted after it and pulled himself aboard. It left the ground and cleared the British entanglements. The damaged controls could not be operated, but by shutting off the engine and trusting to fate, he landed the craft behind the lines out of view of the Huns.

FIND USE FOR VEGETATION THAT CLOGS BIG CANAL

The prevalence of water lettuce and water cabbage on the surface of the Panama Canal channel through Gatun Lake has created a serious problem because these floating plants become entangled in the ship propellers and lock machinery. It appears, also, that mosquito larvæ sometimes escape being suffocated by the crude oil poured on the water by lodging in the roots of these plants and breathing through them. Analysis shows that this vegetation contains about five per cent potash, and as this substance is much needed to fertilize local plantations, it is proposed to make use of these growths, which heretofore have been thought an unmitigated nuisance.

¶It has been announced that a well-known French scientist has found a vaccine for curing and preventing Malta fever, a type of malaria prevalent along the Mediterranean and elsewhere.

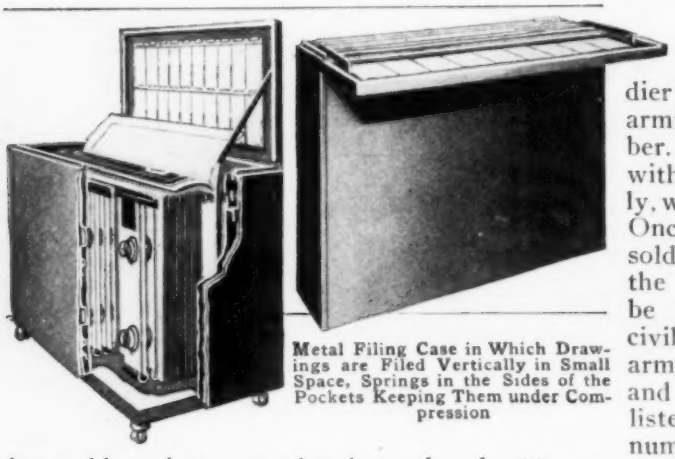
TENANTLESS DOG HUT USED AS PRIVATE HOSE HOUSE

At last a use has been found for a dogless dog house. One man employs such a shelter as an emergency fire station. It is situated between his residence and private garage. Installed at one corner is a two-inch pipe, to which 55 ft. of fire hose is connected. The latter is carried on a pivoted arm that may be swung outside in case of need.

The Hose is Carried on a Swinging Arm Normally Sheltered by the Dog-House Roof

PLANS HELD BY SPRINGS IN NEW FILING CASE

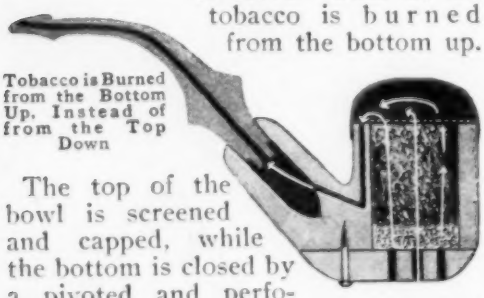
A new metal filing case for architects' drawings is so made that tracings, blueprints, or sketches placed in it are held perfectly smooth in a vertical position without being fastened at the top. The case is equipped with a set of pockets in which labeled folders are inserted. Sets of coil springs, attached to the sides of the pockets, compress the folders so that the drawings are kept flat and uninjured, and at the same time instantly accessible. Being mounted on casters the case can be moved about easily.



Metal Filing Case in Which Drawings are Filed Vertically in Small Space, Springs in the Sides of the Pockets Keeping Them under Compression

STOVE PRINCIPLE EMBODIED IN UPSIDE-DOWN PIPE

For the smoker there is a new pipe designed on the principle of a furnace or stove. That is, the tobacco is burned from the bottom up.



Tobacco is Burned from the Bottom Up, Instead of from the Top Down

The top of the bowl is screened and capped, while the bottom is closed by a pivoted and perforated slab. The air passage extends up the wall of the bowl to the top.

EVERY MAN IN OUR ARMY GIVEN A NUMBER

As a means of prompt identification which will prevent confusion that might arise from two or more persons having the same name, or from other causes, each soldier in the United States armies is being given a number. These numbers begin with 1 and continue indefinitely, without any suffix or prefix. Once assigned a number, a soldier retains it always. For the present no numbers will be assigned to officers and civilians serving with the army. In the British, French, and German armies the enlisted men are each given a number. The British authorities number neither officers nor civilians, while the French give numbers to their officers but not to the civilians.

GERMAN TANKER RECOVERED FROM MISSISSIPPI

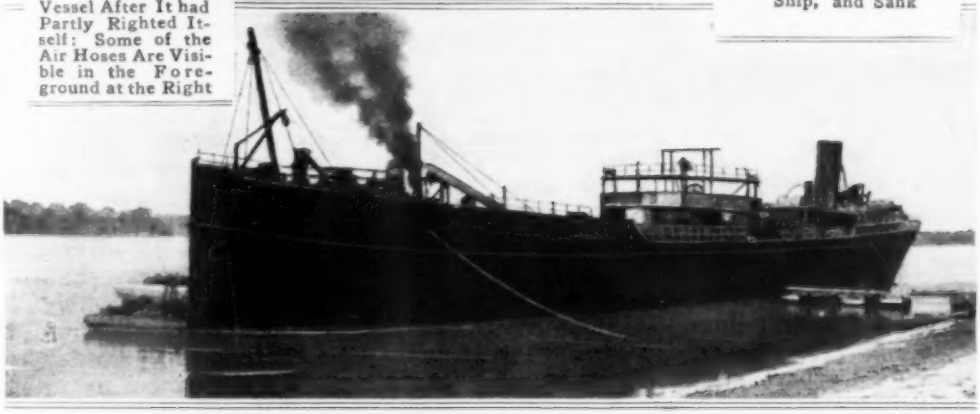
After spending five years on the muddy bottom of the Mississippi River off Baton Rouge, the German tank steamer "Gut Heil" has been raised and placed in dry dock at New Orleans, where it is now being overhauled. Despite deterioration, the vessel is today worth four times as much as when it foundered during an April storm in 1912. The task of raising it, when first undertaken in 1913, met with failure. After being brought to the surface the boat could not be kept afloat and the salvaging work was abandoned. The second attempt was made last June, and in December, with the aid of five long woolen mufflers, it was floated.

After the mud and silt had been pumped from the inside of the vessel, divers sealed two large holes in the hull, bound the bulkheads to the deck with reinforced concrete, and made the seams air-tight. This enabled the

The German Tanker "Gut Heil" Coming to the Surface after Spending Five Years on the Muddy Bottom of the Mississippi River off Baton Rouge

One of the Holes Smashed in the Hull of the Tanker When It Broke Loose during a Storm in 1912, Crashed into Another Ship, and Sank

Deck View of the Vessel After It had Partly Righted Itself: Some of the Air Hoses Are Visible in the Foreground at the Right



Floated and Ready for the Trip to the New Orleans Dry Dock, There to be Overhauled and Made Fit for Ocean Service: When Recovered the Machinery of the Ship was Found to Be in Good Condition

flanking compartments to be controlled separately so that the buoyancy of the vessel could be regulated. A control rack equipped with numerous gauges and valves was mounted on the upturned side of the hull. Hose connected with the valves extended to the various internal compartments of the boat, while the gauges indicated the pressure in each subdivision and the amount of air available for increasing the buoyancy at any given point as the work progressed.

When all was ready to force air into the boat and bring it to the surface, it was discovered that some of the hatches had not been sealed properly. It was then that the seven-foot mufflers were forced into the cracks by divers and the compartments made air-tight. As air was pumped into the ship the water was forced out. Gradually the great hull began to rise, and by controlling the air supply it was made to right itself. When the ship was finally floated and towed to a bank, where an examination could be made, it was found that the machinery was in far better condition than had been expected.

LORRAINE RAISES MONUMENT TO THREE AMERICAN HEROES

Ambassador Sharp at Paris has been presented with the model of the monument that is to be erected by the people of Lorraine to mark the burial place of the three American soldiers who fell during the first clash between our forces and the enemy. The inscription it bears in French reads: "Here, in Lorraine's soil, rest the first three American soldiers killed by the enemy November 3, 1917: Corporal J. B. Gresham, of Evansville, Private Thomas F. Enright, of Pittsburg, and Private Merle D. Hay, of Glidden. As worthy sons of their great and noble country they fought for right, for liberty, for civilization, against German imperialism, the curse of the human race. They died on the battle field of Béthemont."

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Carved on the Cross of Lorraine: "France, United States, 1917, Lorraine to United States." The Monument is to Mark the Resting Place of the First Americans Who Fell in France While Fighting beneath the Stars and Stripes

In Tribute to Corporal J. B. Gresham and Privates Thomas F. Enright and Merle D. Hay, Who Fought "for Right, for Civilization, for Liberty, against German Imperialism, the Curse of the Human Race"

WAR-SERVICE DECORATIONS FOR OUR BOYS IN FRANCE

As a result of a movement started last year in the senate, the War Department has announced the addition of four military decorations to the scant list that has existed in the past. They are known as the distinguished-service cross, the distinguished-service medal, the war-service chevron, and the wound chevron. The cross, cast in bronze, is an award for extraordinary heroism in military operations against the enemy and may be given to any person of either sex serving the army in any capacity. The medal, also of bronze, is for "exceptionally meritorious service to the government in a duty of great responsibility." The same rule of eligibility applies as in the case of the cross. With each decoration there is a ribbon to be worn in lieu of the device in accordance with customary etiquette. No individual is entitled to more than one cross or medal. Subsequent acts of heroism or service that would otherwise be acknowledged by presentation of one or the other of the decorations will be recognized by award, in the first instance, of a bronze oak leaf, and, in the second, of a silver star, to be worn on the riband of the respective devices or on their corresponding ribbons. Each six-month period spent "in the zone of the advance" by an officer or enlisted man entitles him to a gold war-service chevron to be worn on the lower part of the left sleeve of all uniform coats, except fatigue coats. The wound chevron is identical with the war-service chevron and goes on the right sleeve. It is awarded to any officer or enlisted man who receives a wound while in action, or is disabled by gas, and requires medical attention.

¶An increase of 10 miles per hour in the speed of one type of British scout aeroplane has resulted from the use of wires having a streamline cross section instead of round wires, according to reliable authority.

COMMENT AND REVIEW

THE war has stimulated invention and mechanical development along all lines that promise advantage. The Germans are imitative, and, given time, good developers, but they decidedly lack initiative. Planes, dirigibles, and submarines were not invented there. Almost every American man and boy in peace times thinks along mechanical lines. With the inventive energies of the country at work, and a better understanding of requirements, we may reasonably expect some original ideas in fighting machinery to appear in the near future.

Cement Ships

The most interesting development this month is the concrete ship, which gives promise of a great future. The landsman, at first thought, does not relish the idea of going to sea in a "stone boat," but the steel hull passed through its period of opposition, and made practical the construction of larger ships than were ever built with wood, and the concrete ship weighs less than one of same size built of wood, and 600 tons less than one of steel.

Last month, at San Francisco, was successfully launched a cement ship 366 feet in length with 45-feet beam, and a cargo capacity of 5,000 tons. Six months before, the shipyard where it was built was a salt marsh. To equip a yard for building such a vessel of steel would cost half a million; this yard cost $15,000. The "Faith" was launched six weeks after the first cement was poured. With 20 ways, the builders promise they can pour a hull in 10 days, which means three ships, totaling 15,000 to 20,000 tons, per month, or about 250,000 tons per year for one yard. Since August, 1914, the total loss to world shipping was nearly 12,000,000 tons. During that time new ships were built amounting to 6,600,000 tons; a net loss for the war period of 5,400,000 tons. To replace this loss with cement ships like the "Faith" would require 1,080 vessels. Thirty yards, each producing a hull every 10 days would recover this entire loss in one year. While it is unlikely this will be done, as the engines could hardly be turned out as fast as the hulls, it seems within reason to expect ship tonnage to increase a great deal faster than the losses even if the present rate of sinkage should be maintained.

The "Faith"—may her tribe increase—offers little of the traditional beauty which the old-fashioned sailing ship presents. It is strictly a thing of utility, and resembles an oil tanker or mammoth canal boat. But it can be built rapidly, from materials which are easily made (steel rods and cement), and with a large percentage of comparatively unskilled labor.

Production in any considerable amount will permit various economies through improvement in the making and use of the forms, as well as hoisting and distributing of the concrete. The cement ship is the mechanical event of the month in the development of war machinery.

WHILE the man who steals a $150 horse promptly gets a good term in prison, the automobile thieves throughout the country escape entirely or get a few months for stealing a $3,000 car. This makes them very bold. A well-organized force for stealing automobiles usually consists of at least three men. One, the salesman, who under the guise of a traveling representative for some staple article, visits a country town, finds out who is thinking of buying a car, what car he prefers, and its price new. In a most casual way he relates how his next-door neighbor, having recently purchased just such a car for his wife, and she having died, no longer requires it. He gives the car owner's address and makes an appointment by telephone for the two to meet in a few days. In the telephone conversation, the car the buyer wants is adroitly described.

Initial Your Auto

Thereupon the street man gets busy and proceeds to pick up precisely such a car on the street. He drives it rapidly a few blocks, jumps out, and the third man takes it to his place, which has a small garage in front and a concealed workroom in the rear. There some rapid work is done. The wheels, and perhaps one or two other parts, are painted a different color, with a quick-drying paint. Then the numbers which the factory has placed on various easily accessible parts are skillfully altered. A 1 is changed to 7; a 0 becomes a 6, or a 6 an 8.

Numbers are also raised by addition of other figures, and in a manner difficult of detection. In the case of a recently stolen car, the factory reported the engine of that number to be in Cleveland, the body in Dallas, Texas, and the rear axle in San Francisco!

The following day, traveling salesman rolls into country town and finds prospective buyer. Says he was coming out that way and the owner suggested driving the car out. He leaves it with the buyer for a few hours to try it out, while he goes on to the next town to call on his customers. Returning, there is a long-distance conversation between buyer and "owner," and it is arranged to pay the salesman in cash, who makes out a bill of sale as owner's agent. The saving of several hundred dollars on a practically new car makes the buyer anxious to get the bargain, as the car is almost sold to a man in the city, but who can't pay for a week or two. Of course, if the car is discovered, as often happens, the buyer of the stolen car loses both car and money.

The moral is for buyers to purchase only from the established agent, or from an owner who is personally known to be all right; and for owners to identify their cars by placing their initials, or other marks, in such inaccessible places that no ordinary search would discover them.

A Step Backward

THE development of this country has been chiefly due to two things: The printed page and railroads; and the newspaper and magazines reach far beyond the rails. Millions of well-informed people, men and women who would be considered educated people in many lands, never went beyond the grammar grades in school. The daily or weekly perusal and study of dailies, weeklies, and monthlies has been their source of information. The mechanic has been made a better workman, the farmer a larger producer, the merchant a success where otherwise he would have failed, all on this account. Without these agencies of the press, thousands in this country would yet be in ignorance of our state of war.

The weekly and monthly magazines especially have unified our national thought and endeavor; have saved the lives of thousands of infants; have brought comfort into the home life; have broadened the views of the multitude; have awakened the spirit in a backwoods boy which made him a leader in our great cities, and in state and national councils.

To close this great avenue of public information would be a national calamity; to curtail or restrict it is to go back a century.

In its previous session, Congress—hastily and ill-advisedly—increased the rate of postage on periodicals from 50 to 900 per cent, and divided the country into zones, which puts a prohibitive cost on reading matter on those who happen to live any considerable distance from the great publishing centers. The former rate of one cent a pound on magazines to any post office in the country may have been too low, although the Post Office Department has never produced figures to prove it; the new rate is unquestionably very much too high. The one-cent rate was no subsidy to publishers, for the postage rate must come out of the reader.

Conceding a loss to the Post Office Department of one cent per pound, a magazine like this, if every copy were sent by mail, would cost $6,125 a month. A low average of replies to advertisers from its 2,500,000 readers would be 500,000 letters which at three cents for the inquiry and three cents (and usually more) for the reply, amounts to $30,000. Letter mail is actually profitable at one cent per ounce or $10,000 for handling the letters which with $6,125 assumed loss on the magazines amounts to $16,125. If the correspondence stops right here, and no money orders or registered letters follow, the profit to the government on this one magazine, each month, is $13,875.

We very gladly and properly spend millions on our public schools, even furnishing the books free in many cities, to educate a small proportion of the population for a very few years. And now it is law that the printed page, which reaches, interests, and instructs each one, from the kindergarten to old age, shall be reduced and restricted. Unless a sufficient number write their congressmen in protest, a large number (estimated to be one-half) of the weekly and monthly publications will be killed. As the reader must pay the increased postage, we may say for him, the act is both ill-advised and very short-sighted.

WE haven't begun to find ourselves yet in this war, and unless we speedily learn to take many things more seriously, some serious things will take us. And this is not the voice of the croaker—it's good, hard business sense. We have learned to find, and make, and do, a number of essential things for ourselves which formerly we bought abroad. We have found potash in the alkali ponds of the West, and fire clay in numerous localities; we are doing fairly well in our chemical dyes and chemical glassware; we have found a way to manufacture many delicate and complex instruments, and so on down a steadily growing list. We have bought Liberty bonds and Thrift stamps, and made a very creditable showing in saving wheat and meat, but we are still slow in many things.

Finding Ourselves

For instance, we continue to waste gasoline, which is distinctly a war essential. The other evening, about seven, a large car stopped across the street; the occupants entered a house and left the engine running. At eleven, the motor was still going merrily—an absolutely unnecessary waste. The next day several cars were observed, wasting gas in the same way, including two taxies. Somebody was too lazy to crank up for the next start. Delivery trucks run idle for from ten to thirty per cent of the time they are out, and so on.

Figures, even gasoline figures, are dry, but it will do us all good to remember these:

The Army and Navy will require about 1,000,000 gallons per day; motor trucks and cars, 4,800,000 gallons per day; stationary gas engines for power, motorboats, etc., also use a lot. The total production is under 7,000,000 gallons per day.

It is stated that our needless waste of gasoline is over 1,000,000 gallons per day, or sufficient to supply our war requirements. Leaky and badly adjusted carburetors waste 275,000 gallons daily; motors running idle, 150,000 gallons; and needless use of passenger cars 900,000 gallons more. With the increasing number of army trucks, planes, and farm tractors every drop of gasoline will soon become precious.

It isn't altogether the value in dollars and cents that is wasted, it is the gasoline itself. And what will happen here, just as it did abroad three years ago, unless gasoline users wake up, will be first a greatly limited supply per car, and then none at all except for absolute essentials. Few people realize this for the reason they have never known what limitation meant, but how foolish and short-sighted to bring ourselves to any such condition. If a chauffeur knew he would lose his license, or the car owner his number, for violation of this common-sense requirement, there would be few gas engines running idle.

THE long cold winter of 1917-18, in many sections of our snow belt the most severe in 40 years, has passed; snow banks which guarded front doors and cross streets have melted away, and with them has gone the resolve to make those few simple repairs to houses and factories, which will keep out cold and save fuel.

Prepare for Winter Now

The fuel administration is said to have in mind an order which will cut fuel users down to at least 90 per cent of normal requirements. Such a saving would amount to 60,000,000 tons, or more, of coal. If the next winter should prove to be a mild one, the 90 per cent would work little hardship; if a repetition of the one just gone—well, that's a different story.

The time to mend a leaky roof is now; to rebuild a broken fence, at once. The obvious, sensible action in regard to windows that leak cold air, and other parts of a building that are good ventilators but poor heat retainers, is to repair them at once. It will cost no more to make a few storm windows now, than later when it may not be possible to obtain them. The same is true in regard to faulty or insufficient heating apparatus; have them put in shape the minute the winter fires are out.

And if you expect to burn coal next winter, lose no time in putting in your supply. It may not be a cheerful subject to contemplate with the advent of the first warm days, or even popular, but isn't it worth doing?

Then do it now.

THESE are days when the American people can give thanks for a country so generously blessed with millions of fertile acres, and a climate which affords so great a diversity of products. Wars have been fought for centuries before rifles and cannon were invented, or planes and submarines dreamed of. Back of all the inventions and science of warfare must always stand the problem of feeding an army. And the American farmer leads the world. Much has been said of the great efficiency of the German farmer, but even with a most prodigal use of fertilizer he produces much less than half as much per man, and at a greatly increased cost per bushel. And right here we might remark that we have been overfed on German efficiency: We have accepted this form of propaganda without one question or doubt. They are efficient in very many ways, but—as is being discovered—not to the extent we have been told.

The Farmers' Responsibility

AFTER a fair trial, in which the accused were granted every opportunity which legal technicalities permit, a jury of twelve found a German naval officer and his ten accomplices, guilty of conspiracy to blow up food warehouses and food-laden ships in this country. It was proved the leader had over half a million dollars on deposit in an international bank.

Lax Laws

The proof of guilt was conclusive, including the making and placing on local docks of incendiary bombs, and shipment of other bombs to the Pacific coast for use on outgoing vessels there.

A young man, unexpectedly hard up, forges a check for $30 and gets five years.

Another, while intoxicated, steals a horse and is sent up for 10 years.

What punishment would one expect for conspirators who make and place bombs filled with incendiary chemicals on the docks and in the holds of ships to explode hours after when the vessel is at sea?

What they received was the limit of the present law—18 months and a fine of $2,000 each. No wonder spies do not fear to work here.

ON a train in the South last month I met an enthusiastic young corporal of twenty-one returning to his camp after a few days at home with mother. He had left a home where, all his life, he had been the only child. But he passed lightly over the comforts and pleasures he had left behind, and the remark "but I wouldn't be anywhere else" told in unmistakable language of his devotion to his new responsibilities and duty.

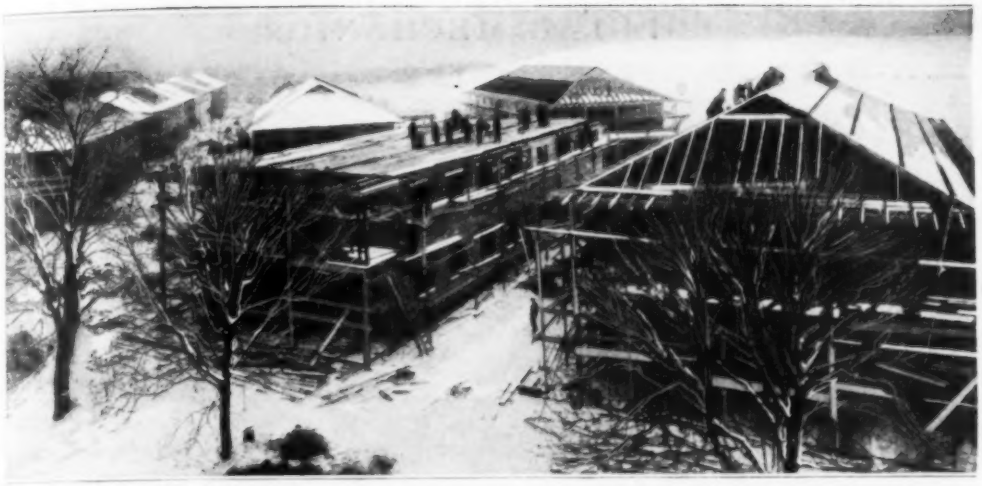
Spirit of 73

He had been in charge of an enlisting station and described one of the applicants, an old farmer who had trudged six miles down the mountain roads of North Carolina to offer himself as a fighter. He was tall and gaunt, with long whiskers, and doubtless had a better acquaintance with "moonshine" than mere hearsay; but his muscles were like iron, his eyes sparkled, and he stood erect as a flagpole. In reply to the usual questions he admitted he was 73 years of age, but insisted he was full of vim. In order not to hurt his feelings the corporal described the strain from hours of drill and what a long hike meant, but with poor results. He was far from convinced: "Don't see no difference; march all day or follow plow. Why, young man, if the mules could stand it I'd plow all day and all night on a full moon. Just try me; I'll show you how to lick Germans." As no other argument made any impression, the corporal finally told him he could render better service by staying at home and raising corn and things to feed the mothers and sisters of the young soldiers. Very reluctantly the old man yielded and the last glimpse revealed the patriotic patriarch vigorously climbing the mountain on his six-mile tramp home.

The spirit of 73 was the reincarnation of the spirit of '76. May we all measure up as well!

H. H. WINDSOR

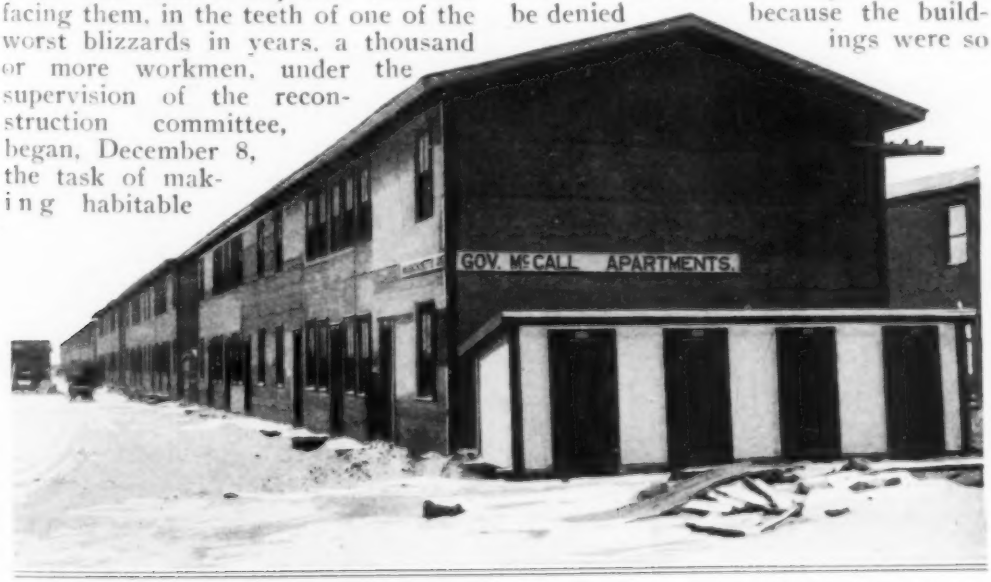
March 25, 1918



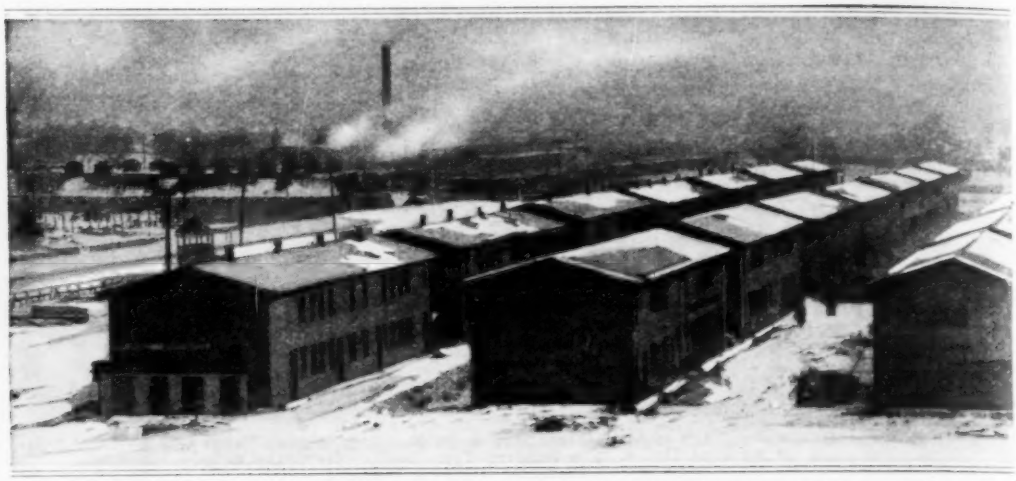
The Two Administration Buildings under Construction in the Foreground Show What was Accomplished in 20 Working Hours. The Military-Type Apartments in the Rear Now House Formerly Homeless Families

TEMPORARY RECONSTRUCTION OF HALIFAX

WITHIN the short space of a few weeks, Halifax, a city of homeless thousands following the explosion of a munition ship in its harbor, has risen from its ruins, a city of repaired residences, temporary buildings, and determined people. Of the structures that were left standing at the time of the disaster not a single one, so far as is known, escaped injury of some kind. With this almost hopeless situation facing them, in the teeth of one of the worst blizzards in years, a thousand or more workmen, under the supervision of the reconstruction committee, began, December 8, the task of making habitable the places that survived, and of providing shelter for some 1,200 destitute families. The number of workers was constantly increased until, on the first of February, 4,562 persons were engaged. In that time 3,894 requests for general repairs, out of a total of 5,258, had been satisfied and the work inspected. The significance of these figures is more apparent when it is known that 555 of the requests had to be denied because the buildings were so



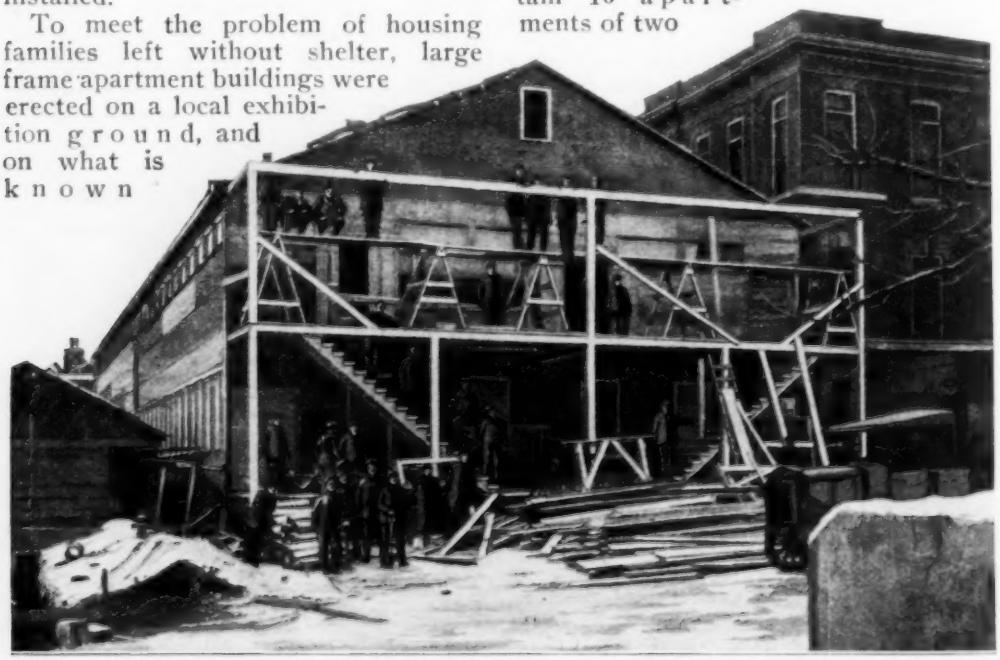
Group of Forty Buildings Named for Governor McCall in Recognition of Quick Work Done by Massachusetts in Getting Aid to Stricken City: Massachusetts Avenue Is at the Left



Panoramic View of the Governor McCall Apartments on the Exhibition Grounds at Halifax: Each of the 40 the City Code. The Picture was Taken After the Carpenters had Worked 32 Days and Practically Completed

badly damaged that condemnation was necessary. In addition, repairs were completed on 57 soldiers' homes, 68 public and relief-work buildings fitted up, 68 barns and stables repaired, 1,867 chimneys rebuilt, and 1,276 sanitary repairs completed. More than two miles of water pipe were laid and a corresponding amount of sewer pipe installed.

To meet the problem of housing families left without shelter, large frame apartment buildings were erected on a local exhibition ground, and on what is known as South Commons. Each of these holds eight apartments of four rooms and bath, the latter fitted with standard plumbing. All the structures were built in accordance with city regulations. Military-type buildings were established on the local recreation grounds so that they might later be used for army purposes. These contain 16 apartments of two



Bunk House and Dining Room at the Alexander McKay School Where 1,800 Workmen were Quartered: When the Men Move into Tents the Place will be Used as a Temporary School. The Picture Shows Result of Six Days' Work

Buildings Contains Eight Flats of Four Rooms and Bath. All of the Work was Executed in Accord with Their Task. Maine, Massachusetts, and Rhode Island Avenues were Named to Honor States Sending Relief

and three rooms each. The speed and efficiency attending the work are noteworthy. The material used up to the first of February gives a good index to the amount of work involved: Seven hundred and ninety-six carloads of lumber, beaver board, roofing paper, nails, brick, cement, lime, sand, tile, glass, and pipe. Enough, in other words, to make 22 trains of 26 cars each, covering about six miles of track —sufficient to encircle the whole city.

NEW FLAG TO BE AWARDED TO THIRD-LOAN BACKERS

A new patriotic banner has been brought out to help stimulate enthusiasm for the third Liberty loan. It is the special honor flag that the Treasury Department will award to every town which exceeds its quota of subscriptions. Furthermore, the names of the towns winning the right to fly this emblem will be represented on a Liberty loan flag to be displayed at the capitol of the state, while the results from each state will be indicated on a national honor flag that will remain permanently in the Treasury Department at Washington.

The new banner has a red border and a white field, across which are three vertical bars of blue. For each time a town doubles the amount of its original quota it will win the right to add a blue star to its flag. Every subscriber will receive a window card bearing a reproduction of the honor flag. Recently, in the presence of thousands,

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Unfurling a Liberty Loan Honor Flag in Front of the Treasury Building in Washington: Insert Shows How a Star is Added Each Time a Town Doubles Its Quota

one of these new emblems was unfurled from the portico of the treasury building.

SIMPLE FINDER ATTACHES TO ANY CAMERA

A simple accessory for amateur photographers is a small trough-shaped

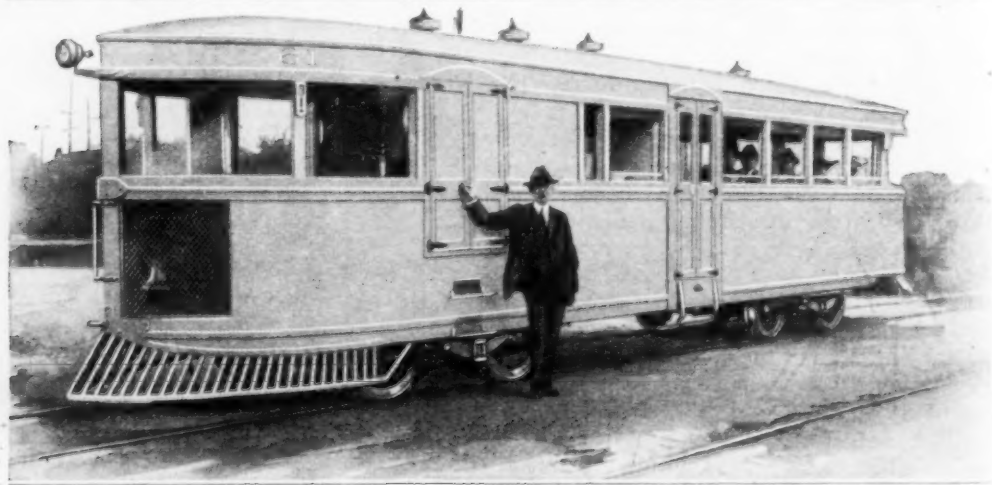
Camera Equipped with Trough-like Finder through Which the Photographer Sights at the Object to be Snapped

metal finder, having no lens, that can be attached to either side or end of any camera by equipping the latter with a metal loop into which a tongue on the bottom of the finder can be inserted. The user sights through the device much as one aims a gun. It is especially convenient when there is an object 4 or 5 ft. high just in front of the photographer, in which case the camera is lifted level with the eye and the finder employed to point it in the proper direction.

GASOLINE RAILWAY CAR OF HANDSOME DESIGN

While gasoline cars for railway passenger service are by no means new, a carrier of this type, lately put into service on the Pacific coast, is of special interest because of its handsome appearance and several features in its construction. It is 40 ft. long, with an engine room occupying the pointed front end. Behind this, in turn, are the smoking room, toilets, and main passenger compartment, the latter terminating in an observation platform. The car will accommodate 32 persons and, because of its low operating cost, is specially suited for long-distance runs where traffic is not too heavy. It can be operated singly or in trains.

Power is furnished by a six-cylinder, 60-hp. motor burning gasoline or distillate, which is stored in an 80-gal. tank. The transmission is of the sliding-gear type connected with worm gearing on the rear axle of the front truck. On its present route the car easily makes steep grades, one of which is seven miles long and has occasional curves, maintaining a speed of 29 miles an hour. It is capable of traveling 40 miles per hour on a straight, level track.



A Gasoline Railway Coach Carrying 32 Passengers, Which can be Operated at Low Cost: It is Driven by a 60-Horsepower Engine and can Travel 40 Miles per Hour

OUR FIRST YEAR IN THE WAR

By GEORGE CREEL

Chairman of the Committee on Public Information

DURING this first year of war, the army of the United States has been increased from 9,524 officers and 202,510 men to 123,800 officers and 1,528,924 men, and the navy from 83,000 to 350,000 men and officers, so that our armed forces have grown, in twelve months, from less than 300,000 to more than 2,000,000 officers and men.

The work of training, arming and outfitting this force has been colossal. Sixteen huge cantonments were provided for assembling the national army of drafted citizens. On May 7, the order was given to select sites. On June 15, the building began. Ninety days later the first contingents of citizen soldiers were being received in veritable cities that had been erected for them, with hospitals, amusement halls, steam-heated barracks, water supply, sewerage systems, and all the civilized conveniences of community life. Sixteen other camps received the National Guard called into Federal service. Sixteen training camps for officers were prepared for the 70,000 entrants who have passed through them. And the navy built 250 new training stations for its volunteers.

An idea of the amount of work involved in this undertaking can be gained from the fact that the Army Medical Corps, in charge of the health of the men, has been enlarged from 800 officers and an enlisted personnel of 5,000, to a force of 15,000 officers and 100,000 enlisted men. And as an indication of the efficiency with which their work has been handled, consider this: There has not been a death in the camps from typhoid or malaria, the two diseases which, in our Spanish-American war, killed more of our men than were slain in battle.

To outfit the men, the quartermaster's office has had 300 woolen mills working on its contracts. It has ordered 20,000,000 blankets, 6,000,000 overcoats, 20,000,000 pairs of shoes, and so forth, endlessly. Every day 2,500 car loads of food and fuel were delivered to the camps. And there have been no contract scandals, no graft, no shoddy work.

The soldiers have been armed by an Ordnance Bureau that consisted of 97 officers a year ago, and now numbers 5,000 officers and 26,000 men. Since the war began it has provided a million and a half rifles. It has brought the production of rifles to an output of 45,000 a week, which is sufficient to supply three army divisions. It has delivered more than 17,000 machine guns and brought the rate of production from 20,000 guns a year to 225,000 a year. It has purchased a billion rounds of ammunition for the cantonments alone. It has brought to quantity production a light Browning machine gun which weighs little more than an ordinary rifle and outclasses any gun of its kind on the European battlefields. And the heavier Colt-Browning machine, now being manufactured, has made the incredible record of firing "20,000 shots in 48 minutes and 16 seconds without malfunction."

The British and French governments, on their own initiative, undertook to supply our forces in France with heavy ordnance so as to save American ship tonnage for food and munitions. Our Ordnance Bureau has, however, proceeded with contracts for the production of heavy guns here. There has never been any machinery built in this country to work so accurately on so large a scale as is necessary for the production of the recoil mechanism of the famous French 75's. These mechanisms must not be "off" two-thousandths of an inch in a length of more than six feet. The Ordnance Bureau had to persuade manufacturers to undertake this difficult work, and to assist them financially in the building of a 13-acre plant and in the purchase and manufacture of $6,000,000 worth of special tools. That is the explanation of a delay which

has been attributed by newspaper critics to the desire of the Ordnance Bureau to "improve on" the perfect recoil mechanism of the French 75's. The plant is now completed and it is turning out the recoil mechanisms. A $25,000,000 ordnance base in France is under way. The bureau has had at its disposal an appropriation of $4,756,500,000 which is three times the ordinary annual expenditure of the whole government in peace time.

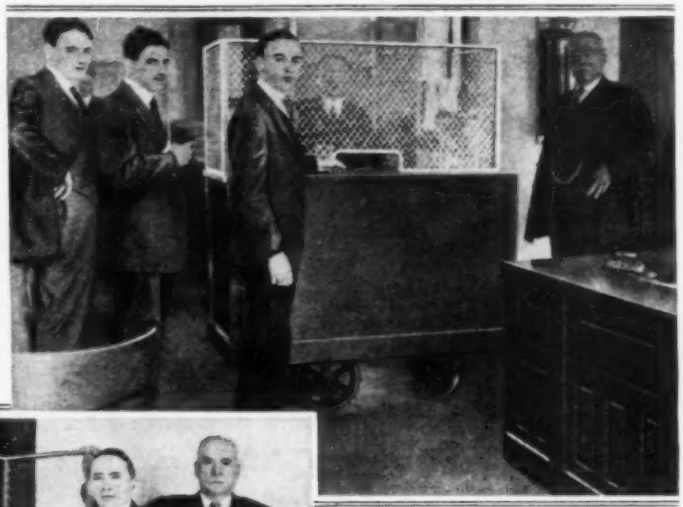
The growth of the navy has been only less phenomenal than the growth of the army. It has more than quadrupled its personnel and more than tripled the size of its fleet. It has taken over the patrol of the western Atlantic and assisted the allies in patrolling European waters. Since the outbreak of the war, it has been engaged continuously in transporting troops, convoying merchant men, and fighting submarines; and it has lost only two naval vessels to the submarines, the destroyer "Jacob Jones," and the patrol vessel "Alcede." In refutation of the campaign of ridicule directed against Secretary Daniels before the war, he has made a record that has been hailed as "the greatest single achievement" of the United States since the war broke out.

The work of supplying and outfitting our "first line of defense" has been done superbly. Ships have been built, men have been trained, guns have been furnished quietly and efficiently. We have been able to help arm the allied fleets. The navy has built its own factories to supply its needs as cheaply as possible, making even the cloth of its uniforms. Much of its work has necessarily been done in secret, but its performance in European waters speaks more eloquently of the concealed details than does even the enthusiastic report of the naval investigating committee of congress, which found nothing to blame and everything to praise.

The navy's huge program of shipbuilding has made it difficult for the Shipping Board to realize its expected output of tonnage to replace merchant vessels sunk by submarines. At the same time, our foreign commerce has increased from $2,000,000,000 to $9,000,000,000 a year, and our seaboard has been piled with goods waiting transportation abroad. These goods, having filled the terminals, have also congested the railroads for miles back from the coast, and complicated the problems not only of the director-general of railroads but also of the fuel administrator and the food administrator. The congestion of traffic sidetracked so many cars filled with coal that "workless Mondays" had to be decreed, during the winter, in order to free coal for the ships so that the ships might free the railroads. As a result of that order, within twelve days, 450 ships were cleared from our ports with 2,000,000 tons of food, fuel and munitions, the traffic congestion was relieved, and the stoppage in the coal supply was removed. Now, the shortage of ships has backed up our meat supply in the storage warehouses and on the farms, so that the food administration has had to abandon its program of "meatless" days. It is hastening cargoes of meat to Europe and stimulating the purchase of the higher grades of beef by the government, so as to empty the "freezers." And the ship shortage is being relieved by the requisitioning of the Dutch ships and by the addition of new American vessels.

Since the outbreak of war, the Shipping Board has taken over 112 German and Austrian ships of 788,000 dead-weight tonnage. It has also taken over 425 steel vessels, privately owned, of nearly three millions dead-weight tons. It has let contracts for 720 steel vessels of 5,166,400 dead-weight tons. Of the requisitioned vessels 72 have been completed and put in service, 15 have been reconveyed to their original owners, and 52 have been launched but not completed. And of the contracted vessels two of 17,600 dead-weight tons have been completed and three of 26,400 tons launched but not completed. Of wooden vessels the board has let contracts for 490 ships of 1,715,000

dead-weight tons, of which eight had been launched but none completed on March 1. The figures given out by the British Admiralty on March 20 showed that the allied shipyards were making up 75 per cent of their losses. An increase of 100,000 tons a month is necessary to replace the losses completely with new ships. The Shipping Board estimates that American shipyards will complete 12 vessels in May, 22 in June, 52 in July, 35 in August, and 97 in September. Meanwhile, the taking over of a half million tons of Dutch shipping, on March 21, will carry the allies across the spring months and make it possible to catch up with submarine losses in time to put the strength of the United States into the summer campaign.



Tens of Thousands of Dollars are Paid Out from This Cabinet Each Month. The Arrangement Saves Each Employe About 11 Minutes

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¶ Jeweled sugar cases for women in which the owner can carry to a restaurant or the home of a friend enough sweetening for her own tea, are a French novelty that is unmistakably a product of war times. They are made in a great variety of shapes.

PORTABLE MINIATURE BANK SAVES TIME ON PAY DAY

A perambulating miniature bank is the latest time-saving fixture to be installed in a large office. On pay days it saves the 2,500 men and women employed in the concern many hours of time once wasted standing in line before the cashier's window. The new article of furniture is a strongly made cabinet mounted on two large rubber-tired wheels and two small swivel wheels, like a baggage truck. A heavy wire netting, inclosing on three sides the top of the desk, affords protection to the cashier and guards standing behind it. A cash drawer and three reserve drawers have a capacity of thousands of dollars in bank notes and change. Handles are provided at each end of the cabinet.

Cashing Pay Checks at the Perambulating Bank: The Outfit Visits Each Department in an Office Employing 2,500 Persons

Under the new arrangement, checks are distributed through the various departments as usual, and a few minutes later this "office pay car," as it has been nicknamed, makes its way from room to room, cashing the checks.

Small Boats Taking Survivors from the "Florizel" to Other Steamers That had Rushed to the Scene: Foreground. After the Wreck, the Sea Continued So Rough That the Rescuers

TOWER OF BURNING CHURCH SNAPPED AS IT FALLS

A spectacular incident in a $50,000 fire, that destroyed a large Newark, N. J., church recently, was the falling

A Photograph Taken at the Instant the Tower of This Burning Church was Falling to the Ground

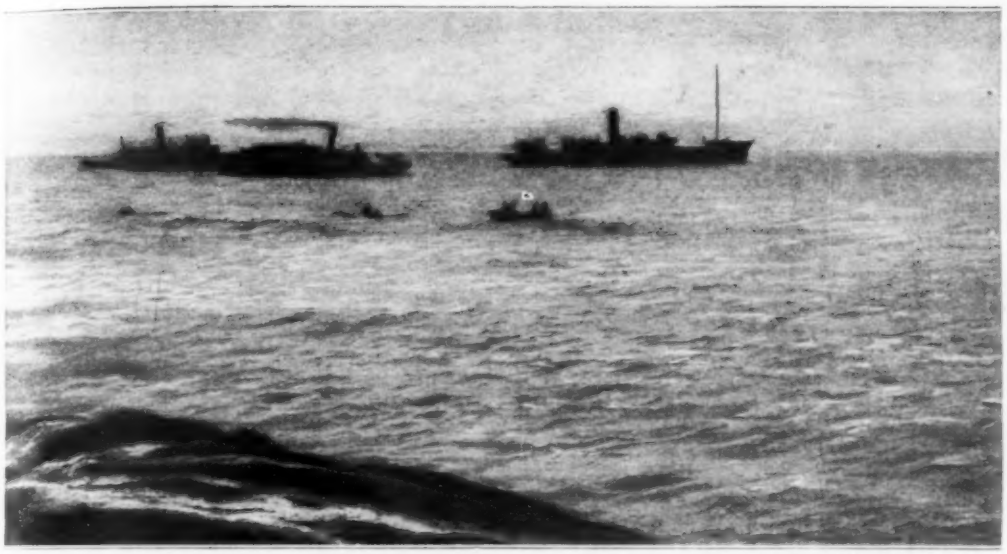
of the tower, the supports of which were weakened by the burning away of the roof. The accompanying photograph is remarkable in that it was snapped at the very instant that this fall took place. It shows the upper part of the tower swung over at right angles to its base.

HEAT MATTRESS FOR SICK WITH ELECTRICITY

An English physician has recently devised an electrically heated mattress for use by pneumonia patients. Wires enter through a terminal which is imbedded in the mattress so as not to be subject to wear or injury. That they may be thoroughly insulated, the resistance wires pass through glass beads and are also inclosed by flexible tubing of metal. The current is so controlled that there is no heat at the head, a moderate heat in the middle, and a maximum at the foot. By means of a variable resistance the heat can be regulated as desired.

RED CROSS LINER ON REEF, HEROIC RESCUES MADE

No photographs can adequately picture the tragedy that occurred a few weeks ago in a blizzard when the Red Cross liner "Florizel" ran upon a reef near Cape Race. Most of the 136



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The Ill-Fated Red Cross Liner, at the Extreme Right, was Impaled on a Reef Like the One in the Undertook Their Task amid the Hidden Rocks in the Face of the Gravest Peril

on board, who rushed to the deck after the crash, were swept overboard. Nearly 100 lives were lost, those remaining huddled for hours in the forecastle, suffering terribly from the cold and anguish of mind. When the sea finally burst in the side of the shelter, it appeared that all would perish. Though the wreck was but a few hundred feet from the rocky shore, life lines proved useless. Finally volunteers manned surfboats and dories and put out from a larger vessel that had rushed to the scene. In the face of the gravest peril they succeeded in rescuing all who remained on board.

MARINE CORPS TRAINS MEN FOR SIGNAL BATTALION

Many young men having ability in mechanical and electrical lines will be interested to learn that the Marine Corps has a signal battalion, as have other branches of our military service. At the headquarters, at Philadelphia, men are trained to be radio operators, telegraphers, electricians, linemen, repair men, gas-engine men, motorcyclists, switchboard operators, etc. Just now the battalion offers exceptional opportunities along the lines indicated. Full information can be obtained by addressing Headquarters, Signal Battalion, Marine Barracks, Navy Yard, Philadelphia.

LATEST OUTDOOR SUIT IS SLEEVELESS

Simple but decidedly attractive lines, in which there is a suggestion of the military uniform, mark the new sport suit shown herewith. The jumper is unusual in that it is sleeveless and open under the arms, making the front and back separate, and giving the wearer just the freedom needed in outdoor activities.

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¶Action has been taken to make New York as important a port of search as Halifax for vessels bound for British or neutral European ports, thereby saving much time and coal for many ships that heretofore have had to detour to the northern port.

WAR BEGINS EXACTING ITS TOLL FROM SAMMIES

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Portable Disinfecting Plants on the Way to the Pier for Shipment Overseas: Trench Vermin Spread Disease and It Is for the Purpose of Ridding Soldiers' Clothing of Such Parasites That These Sterilizing and Fumigating Units have been Designed

COPYRIGHT, COM. ON PUB. INF.

Soldiers must Have Quick Wits, and Here Is One of the Ways That Mental Alertness is Tested, in Order to Eliminate the Unfit from the Army Rolls. The Various Blocks must be Put in Their Proper Places within a Specified Time

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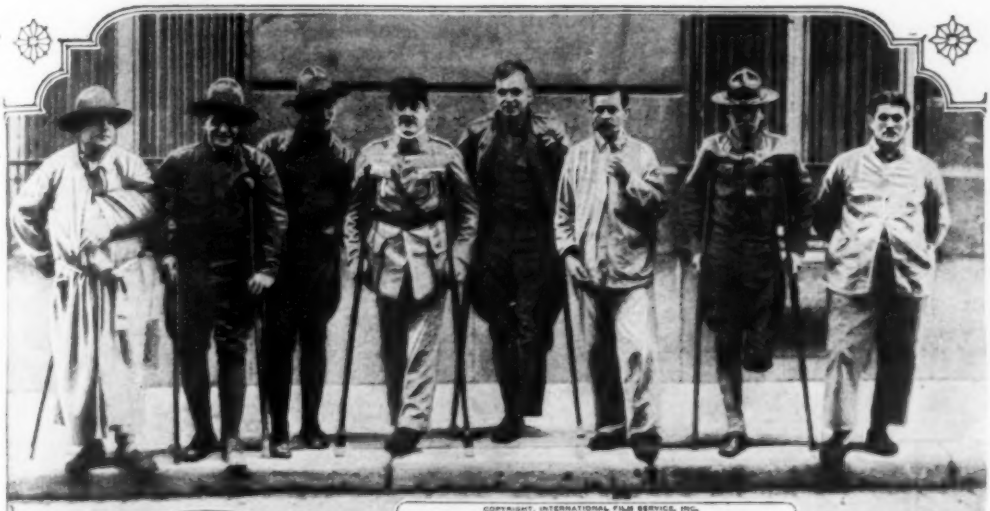
A Church Used by Many Races and Creeds at Camp Upton, New York, Attended by Soldiers in Training: Many Who Once Avoided Religious Services Now Find Their Way to Pews Like Veteran Churchmen

AS AMERICA PROVIDES FOR THEIR VARIED NEEDS



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Among the First in Our Army to Pay in Wounds the Price of Patriotism: These Men are Recuperating in a Paris Hospital. The One at the Extreme Right was Wounded and Captured by the Germans and Later Rescued by the British

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Here the First American Officer, a Lieutenant in the Signal Corps, was Wounded, and the French, with Characteristic Chivalry, have Marked the Spot with This Tablet. The Injured Man has Fully Recovered

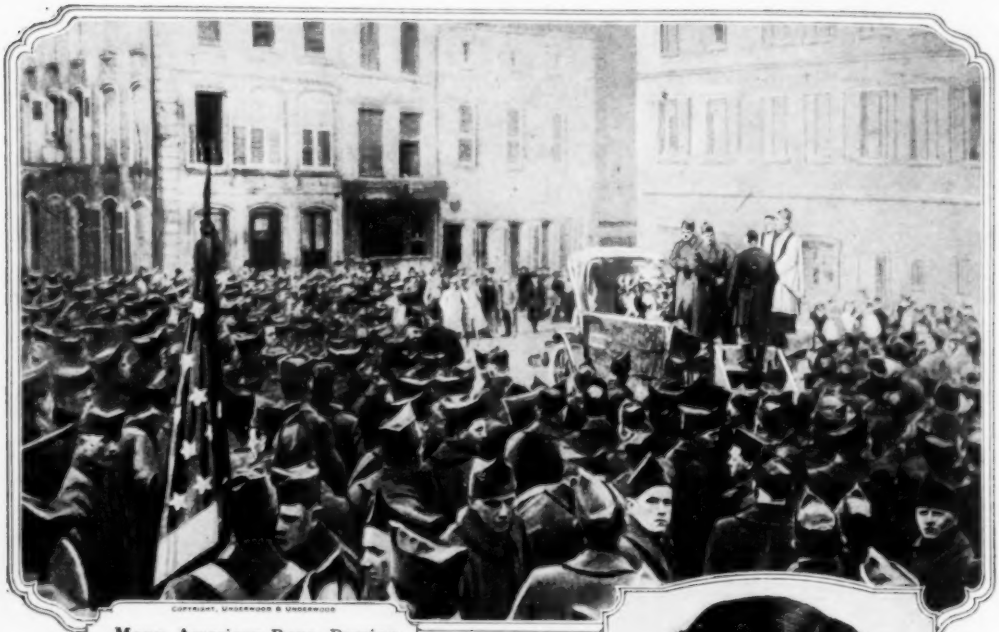
IDENTITY CARD (CARTE D'IDENTITÉ)
Rank and name (rang et nom) Pvt. George F. Taylor
Unit (unité) Co. "D" 4th Engrs. (Ry.) U.S.A.
is authorized to proceed from
for (durée) to
Reason (motif) Leave
OFFICIAL
PARIS
Date Jan. 17 1918.

A Little Identification Card That Means a Respite from Trench Life: The Owner is Entitled to Spend His Leave in Paris, Marseilles, or Nice. Without It He Is Subject to Arrest by American Military Police

COPYRIGHT, INTERNATIONAL FILM SERVICE, INC.

A Close-Up View of One of the Disinfecting Wagons Shown on the Opposite Page: Each Outfit Is Complete in Itself. Garments to be Treated are Placed in the Cage, Here Partly Withdrawn

STRIKING WAR INCIDENTS TOLD PICTORIALLY



Many American Boys, Passing through a French Village on the Way to the Trenches for the First Time, were Baptized at a Street Corner by a Divine Whose Altar was Carried on a Motor Truck Specially Outfitted for the Occasion. The Soldiers are Shown Here Wearing Caps Instead of Their Familiar Broad-Brimmed Hats

To Prepare Prisoners for Grueling, the Huns Strap Them to Posts Where They are Left Exposed to the Elements for 48 Hours, Tantalized Meanwhile by Bowls of Food Placed Out of Reach at Their Feet. This Picture was Smuggled from Germany by W. J. Prendergast, an American Who Served with the Dublin Fusiliers Until Captured in November, 1914. His Photograph Appears in the Insert. He was Bound to the Post Shown Above. Some Time Ago He was Exchanged and has Returned to This Country

MARCHING YANKEES, OODLES OF THEM, OVERSEAS

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Surviving Heroes of the "Tuscania" Marching between Throngs in the Streets of Southampton. At Every Hand Our Boys were Received with Whole-Hearted Hospitality

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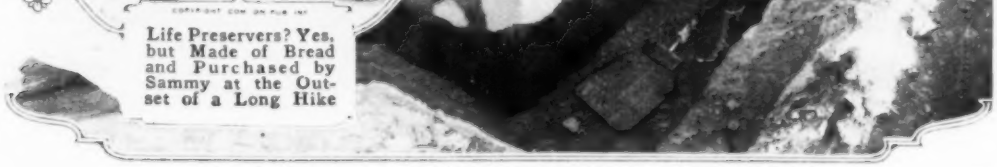
Sam's Sons of the 166th Infantry Passing through a French Town on the Way from the Coast to Their Training Camp



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American Soldiers Driving Poison Fumes from a Trench with the Aid of Gas Flappers

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Life Preservers? Yes, but Made of Bread and Purchased by Sammy at the Outset of a Long Hike

ALL THE WAY FROM FLANDERS TO MESOPOTAMIA

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Irish Guards Wearing Steel Armor Taken from Germans Captured by Them

Remains of Two of the British Admiralty's Lath-and-Canvas Warships Used Early in the War to Fool the Enemy: Boats of This Sort Made a Sham Attack at Gallipoli When Troops were Landed

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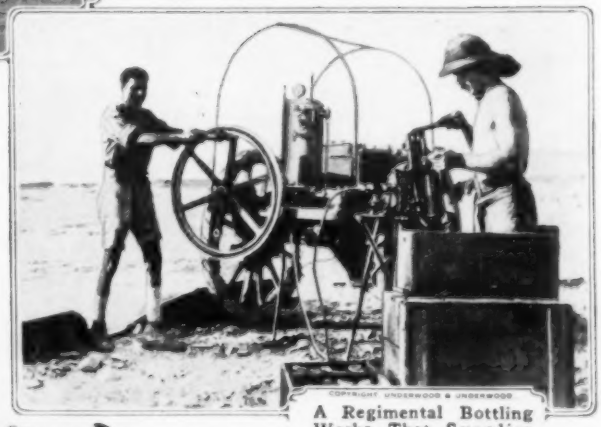
Mud Is Mud the World Over, but Especially on the Western Front. Here Tommy is Rescuing Mired Mules

WITH WHIMSICAL TOMMY AND HIS BALLY JOB

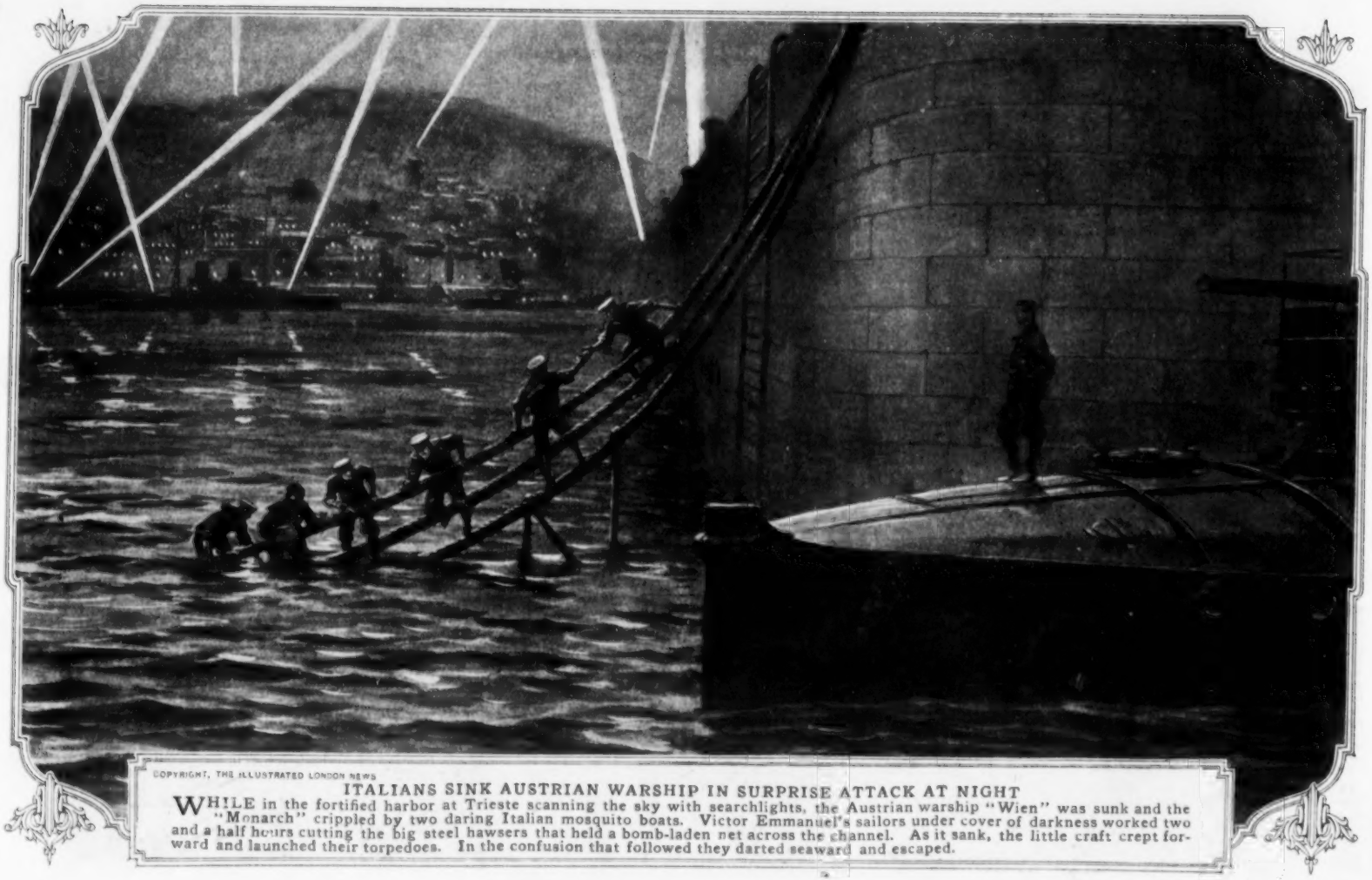
In War the Tractor has Done Everything but Fly. This One is Crossing a River in Palestine

A British Pilot and His Observer Getting into Their Togs Preparatory to a Flight



A Regimental Bottling Works That Supplies Tommy with Soda Water in Mesopotamia

An Overturned Concrete Tank Fitted with Bunks for the Accommodation of Tommies on the Western Front



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ITALIANS SINK AUSTRIAN WARSHIP IN SURPRISE ATTACK AT NIGHT

WHILE in the fortified harbor at Trieste scanning the sky with searchlights, the Austrian warship "Wien" was sunk and the "Monarch" crippled by two daring Italian mosquito boats. Victor Emmanuel's sailors under cover of darkness worked two and a half hours cutting the big steel hawsers that held a bomb-laden net across the channel. As it sank, the little craft crept forward and launched their torpedoes. In the confusion that followed they darted seaward and escaped.

IN FRANCE WHERE WAR IS A STERN REALITY

COURTESY OF L'ILLUSTRATION

What Chances Have Our Sons of Returning? Chevrons of These Poilus Represent Each Six Months' Service at the Front. From Left to Right: Automatic-Rifle Infantrist, Rifle Grenadier, Trench "Cleaner," Hand Grenadier, Special "Shock" Infantrist

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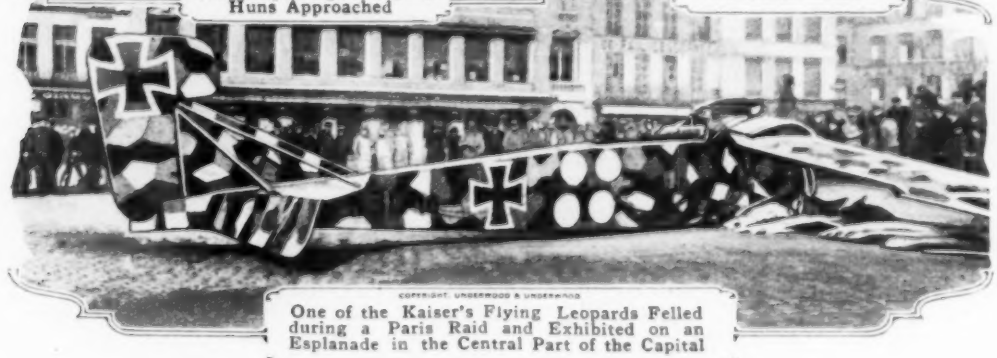
Two Hundred Little Tots were Removed from This Paris Orphanage as Flying Huns Approached

Marne Sector: Searching with Trained Dogs for Wounded Poilus in "No Man's Land"



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One of the Kaiser's Flying Leopards Felled during a Paris Raid and Exhibited on an Esplanade in the Central Part of the Capital

AERIAL PHOTO PICTURES TANK ATTACK ON HUNS

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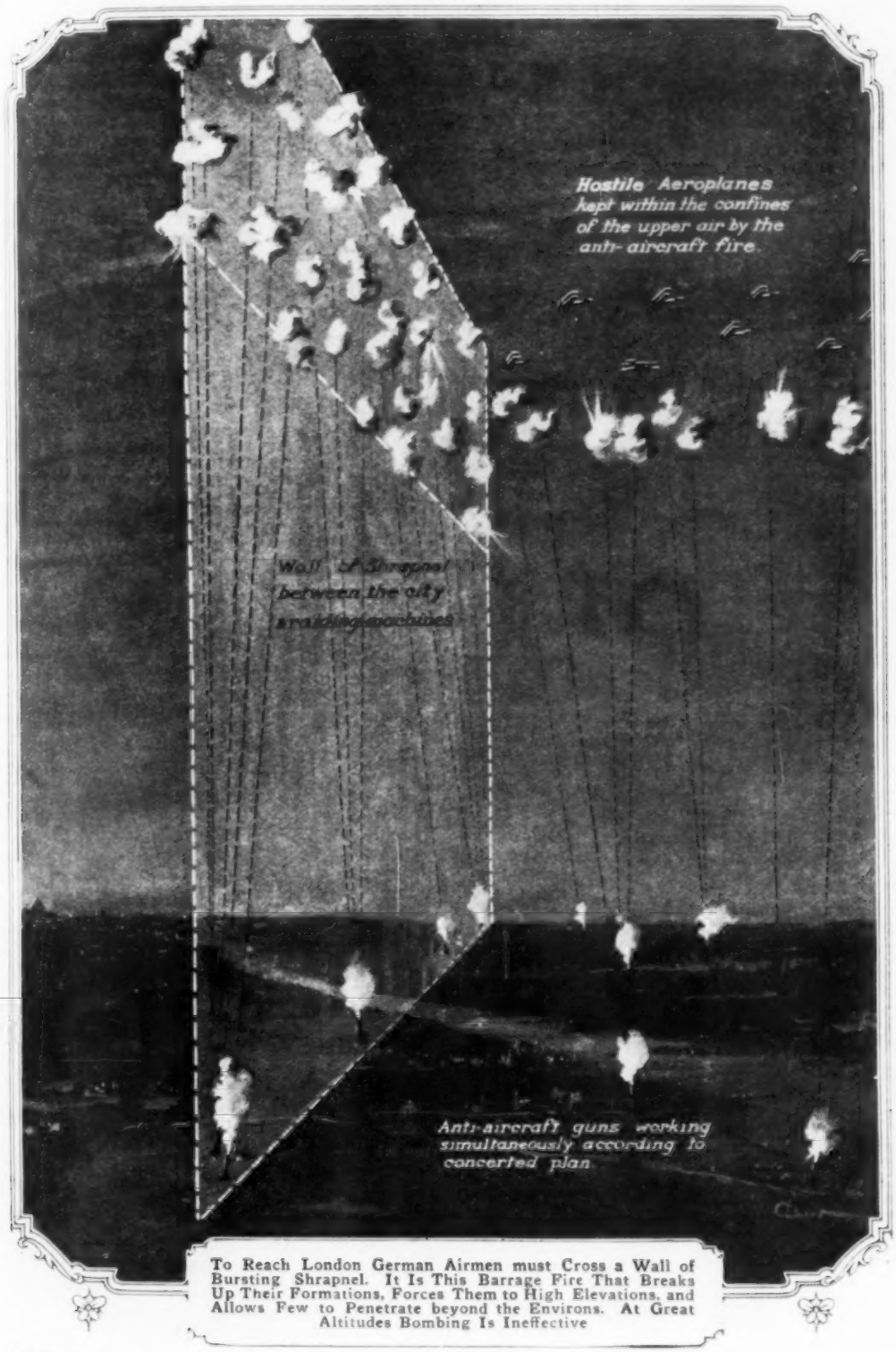
In the Heat of Battle, a Battery of Tanks on the Soissons Front Charging the German First-Line Trench, Shown at the Top, at a Point Where It and the Entanglements have been Leveled by Heavy Shells: Three Distinct Systems of Wire Defenses are Visible at the Left of the Four Buglike Tanks, Sent Forth to Smash a Path for the Infantry. In Contrast to the Regular Outline of the Boche's Position Is the Thin, Wavy Line at the Bottom of the Page. Along This the French have Hastily Dug-In after Going "Over the Top" and Encountering Severe Machine-Gun Fire

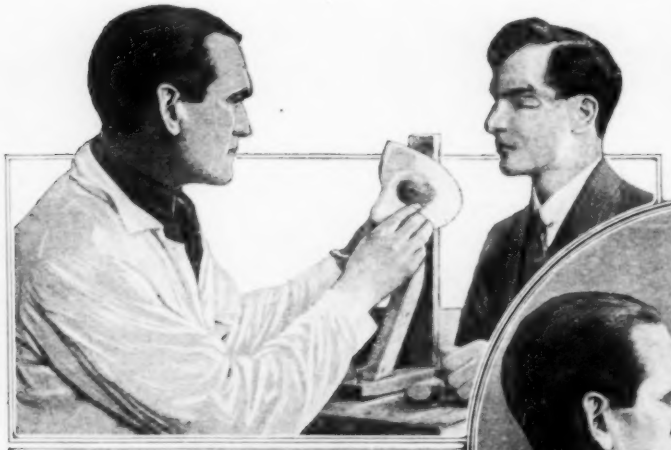
CURTAIN OF DEATH DRAWN BEFORE FLYING HUNS


Hostile Aeroplanes kept within the confines of the upper air by the anti-aircraft fire
Wall of Shrapnel between the city and raiding machines
Anti-aircraft guns working simultaneously according to concerted plan

To Reach London German Airmen must Cross a Wall of Bursting Shrapnel. It Is This Barrage Fire That Breaks Up Their Formations, Forces Them to High Elevations, and Allows Few to Penetrate beyond the Environs. At Great Altitudes Bombing Is Ineffective

FROM THE SPHERE, LONDON. COPYRIGHT IN THE UNITED STATES BY THE NEW YORK HERALD CO.

RESTORING FACES OF DISFIGURED FIGHTERS



The Character of the Injury and the Mask That has been Made to Cover It are Shown at the Side. Below, the Sculptor is Putting the Finishing Touches to the Work

Assortment of Plates in Different Stages of Construction: Each was Designed to Conceal the Disfigurement of Some Particular Soldier

Here Is a Concrete Example of the Sculptor's Art as Applied to Facial Restoration. The Picture at the Left Shows a Deep Hole between the Eyes of a Young British Soldier. At the Right the Ghastly Scar is Completely Hidden behind a Plate Held in Place by Glasses

PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD

GAS STATIONS ESTABLISHED AT CURBS FOR MOTORISTS

For the accommodation of British motorists who now depend upon illuminating gas for fuel, filling stations have been established at convenient points in London and other cities. One type that is frequently seen consists of a valve-controlled plug situated at the curb line in front of a tiny office built like a sentry box, at the inner edge of the sidewalk, for the attendant. Connection between the plug and the gas bag of a car is made with a piece of inner tubing. A meter provided on the gas bag is the only one used, for a container is calibrated and its capacity printed upon it by the gas company when it is filled for the first time. With this arrangement it requires about five minutes to charge a 250-cu.-ft. container.

AERO CLUB STRIKES MEDAL FOR HEROIC AIRMEN

Distinguished service rendered by our airmen and their French and British comrades will be recognized by the Aero Club of America, which plans to award "Honor and Merit" medals. An image of the "muse of the air" appears on one side of the piece and is encircled by 48 stars, 13 of which surround the head. In Latin appear the words: "For those who strive in the air, a crown of stars." The opposite side bears the legend, "Honor and Merit," the seal of the club, the year of our entrance into the war, and space for inscription of the name of the recipient.

The Aero Club's Medal of Honor and Merit for Distinguished Service in the Air

"STRETCHING WHEEL" SAVES TIME IN HANDLING GAUZE

Through the use of a "stretching wheel," Red Cross workers at Cincinnati save much time in handling gauze

Gauze is Wound Smoothly on the Wheel, Then Cut Crosswise, and Laid Back on the Cutting Table

for surgical dressings. The device resembles somewhat the drums on which moving-picture film is dried after development. Twenty thicknesses of gauze are wound on it. The material is then cut crosswise and laid back on an adjacent table ready for the electric cutter. The equipment enables three women to do in 10 minutes work that formerly required the services of six women for 55 minutes, thus increasing the output of the shop.

SIPHON IRRIGATING WATER UNDER RAILROAD

An interesting example of irrigation engineering is to be found at the point where a large ditch in a western state crosses a railway. The ditch not being high enough above the track to permit the water to be carried across by a viaduct, an inverted concrete siphon was constructed which allowed the water to pass beneath the railroad

and up on the other side, the level of the downstream end of the siphon be-

Intersection of Railroad and Irrigation Ditch Showing Exposed Portions of Concrete Siphon That Passes beneath the Track

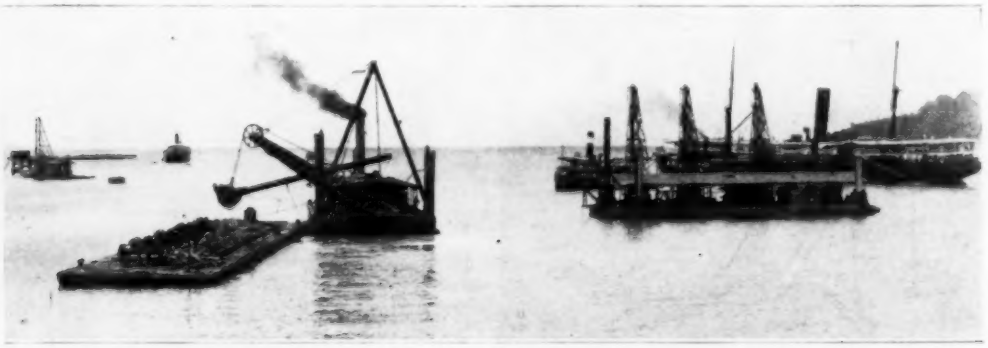
ing sufficiently below that of the upstream end.

WILD BIRDS ARE CALLED BY BARGE'S WHISTLE

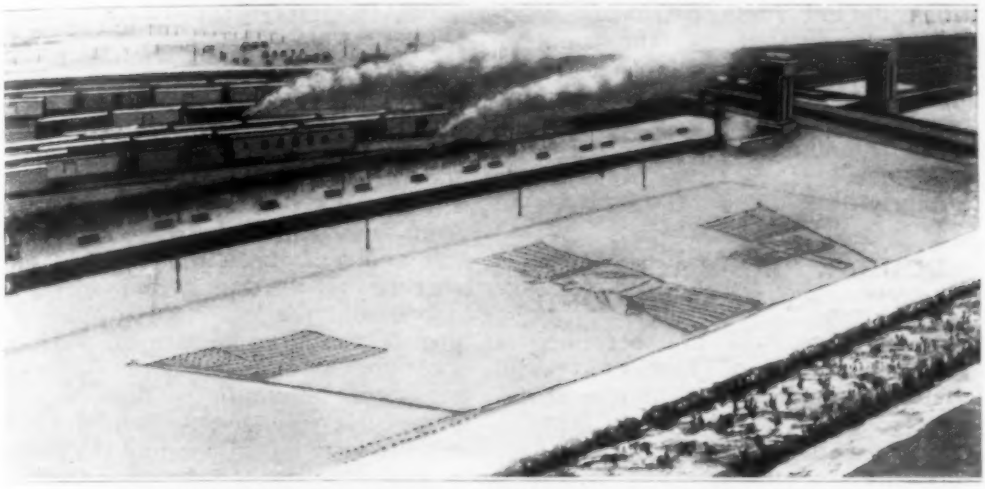
A striking example of wild-bird intelligence has been observed on the Panama Canal in connection with the underwater blasting that is carried on there. A barge has been especially equipped for drilling blast holes below the water and depositing charges in them. When a blast is ready the craft moves off to a safe distance, and before setting off the dynamite, the barge whistle is blown several times to warn all vessels in the vicinity. Instantly numbers of wild birds may be seen coming from all directions, the reason being they have learned that many dead and stunned fish rise to the surface of the water following each explosion. To them this particular whistle is like a dinner gong. More remarkable still, they readily distinguish between this whistle and others. Canal workmen and natives also share in the harvest.

PORT SAID TO CAPE TOWN MADE IN 60 DAYS

According to the north-to-south trans-African time-table, the first that has been made, the 6,011-mile journey from Port Said to Cape Town can be accomplished in about 60 days, providing all connections are properly made. The route goes by way of Cairo, Lake Albert, and Lake Tanganyika, and is divided into six sections which are covered by rail, motor, steamer, hammock, and on foot. If London is made the starting point, four days must be added to the schedule to provide for transportation by rail to Brindisi and by boat to Port Said. From Redjaf to Nimule in lower Sudan, a 150-mile leg of the journey, one must travel afoot or by hammock, as is also the case over the 200 miles between Muansa, on Lake Victoria-Nyanza, and Tabora in what, before the war, was German East Africa.



Barges in Panama Canal Dredging and Preparing Underwater Blasts: When the Latter Are Ready All Craft Move Off a Safe Distance and a Warning Whistle is Blown. Birds from All Directions Respond, Knowing That Stunned Fish will Soon be Floating on the Water



FOOTPRINT ARTIST DECORATES CHICAGO'S LAKE FRONT PARKWAY

AFTER the sunken panel flanking Michigan Avenue north of the Art Institute at Chicago had been frosted with white by an early spring snowstorm, a small boy spread the gospel of patriotism by decorating the area with foot-drawn cartoons. Uncle Sam, the Stars and Stripes, and the Red Cross insignia were subjects of his pedal skill that were treated with considerable deftness before an audience of hundreds of office workers and club members crowding the windows of tall buildings overlooking Grant Park. Although the work was merely the play of a youngster who had nothing else to occupy him, it was sufficiently well done to win the plaudits of those he entertained.

STUDY THE PICTURE FIRST, THEN READ THE STORY

Six persons were shown the accompanying photograph and asked to explain what it represents. Here are their guesses: Six cylindrical balloons and three dirigibles illuminated at night; reflections of light from a sleet-incrusted wire; a string of lights along a hilly boulevard on a rainy night; Japanese lanterns at a lawn fête held late in the fall; signals from a military aeroplane in flight; the moon photographed nine times, giving the effect of . . . - - - . . . , which in the continental wireless code is S O S, the signal of distress. The last reply is correct.

Here Is a Peculiar Picture. Make Your Guess as to What It Is

LOW-GRADE MOTOR FUELS PRODUCE DEADLY FUMES

A recent unprecedented increase in the number of deaths from petromortis, or poisoning by breathing exhaust fumes from internal-combustion motors, has pointed out a new and increasing danger in the use of the present low-grade fuels. Asphyxiation from the operation of motors in poorly ventilated or closed places has been common, since motor vehicles came into general use, but in the past three months there has been a greater number of such deaths than in all the years heretofore. This is attributed to the fact that as the demands for fuel have increased, greater quan-

tities of low-grade petroleum products have entered into the manufacture of gasoline and other motor spirits. The combustion of these materials produces a great quantity of carbon monoxide and other gases far more deadly than those of the fuels formerly in common use.

DOUBLE FIREPLACES GIVE COMFORT YEAR AROUND

Double fireplaces are becoming a popular feature of homes in mild climates, being built with one recess

An Urban Home in Which a Double Fireplace has been Incorporated in a Very Pleasing Way

indoors and the other opening onto a porch that is either covered or uncovered. The idea has been employed for some time in designing mountain cabins in the West. In cold, wet weather the comfort of an indoor log fire can be enjoyed, while during the summer, when the evenings are too cool to sit on a veranda, a cheery blaze

A Mountain Cabin with an Artistic Chimney That Serves Both an Indoor and an Outdoor Fireplace

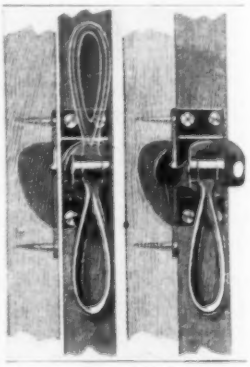
in the outdoor fireplace adds just the warmth needed. The chimneys for these fireplaces are built with two flues.

TRAPSHOOTERS MAKE GOOD MARKSMEN IN AIR

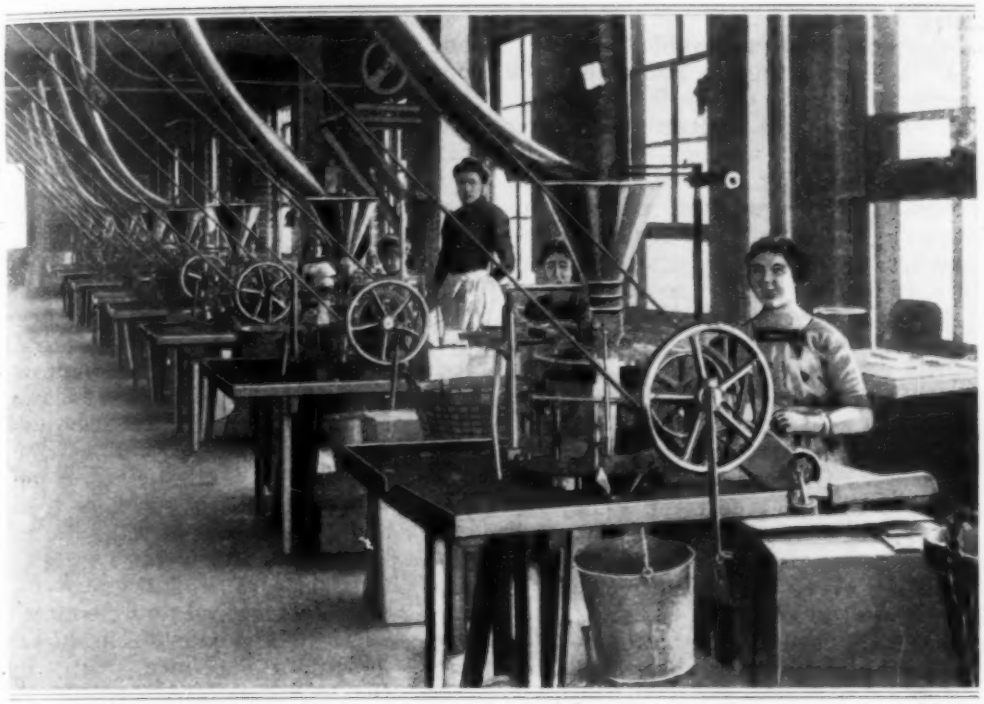
Trapshooting has proved valuable in teaching student airmen at ground schools the knack of hitting objects moving rapidly through space. There seems to be a certain analogy between a machine gun with an aeroplane target and a shotgun used against clay pigeons. If an aspiring young flier is hopeless at the latter sport, it usually proves out that he has no business jockeying with Fritz in the upper atmosphere. Essentially, however, the practice is intended to help the men acquire visual alertness and the ability to estimate quickly the direction and speed of travel of a flying object.

NEW LATCH FOR BARNS OR OUTBUILDINGS

A new door latch of malleable iron, which can be attached to the edge of single, double, or parallel doors, is provided with a handle mounted on a swiveled base and controlling a flat hook which is eccentrically mounted beneath it. By swinging the handle around, the hook is made to swing out from the edge of the door and engage a lug in the adjoining jamb. At the same time it draws the door to so tightly that it is weatherproof. Provision is made for securely locking the latch with a padlock.



¶Our first war trophy, a machine gun abandoned by the Huns during their abortive attack on the American lines the week of March 2, may be brought to Washington. The piece is new and probably had not been in use long enough to kill an American.



The Machines in This Battery Automatically Weigh the Seed and Fill 1,250 Packets a Minute. To Supply the Demand Placed on the Government, They are Kept Busy Four Months Each Year

FREE SEED KEEP GARDENS OF NATION GREEN

FOR many years springtime has been heralded no more faithfully by the first robins than by the assortments of seed franked to "the folks back home" by members of congress. So long has this annual distribution been practiced that most of us "constituents" receive the packages from Washington in the same matter-of-fact way that we remove samples of Soandso's predigested cereal for warm-weather breakfasts from our front porches each year. To comparatively few of us, therefore, has it ever occurred that the United States government is one of the world's largest buyers of garden and flower seed.

The few ounces of seed carried to us by the postman give no impression of the acres upon acres of land devoted to their propagation, or the care taken in determining their fitness for planting. But these small envelopes represent tens of thousands of others, and those

From All Parts of the World Rare Plants and Bulbs are Received. This Shows One Such Shipment under Cover at Washington

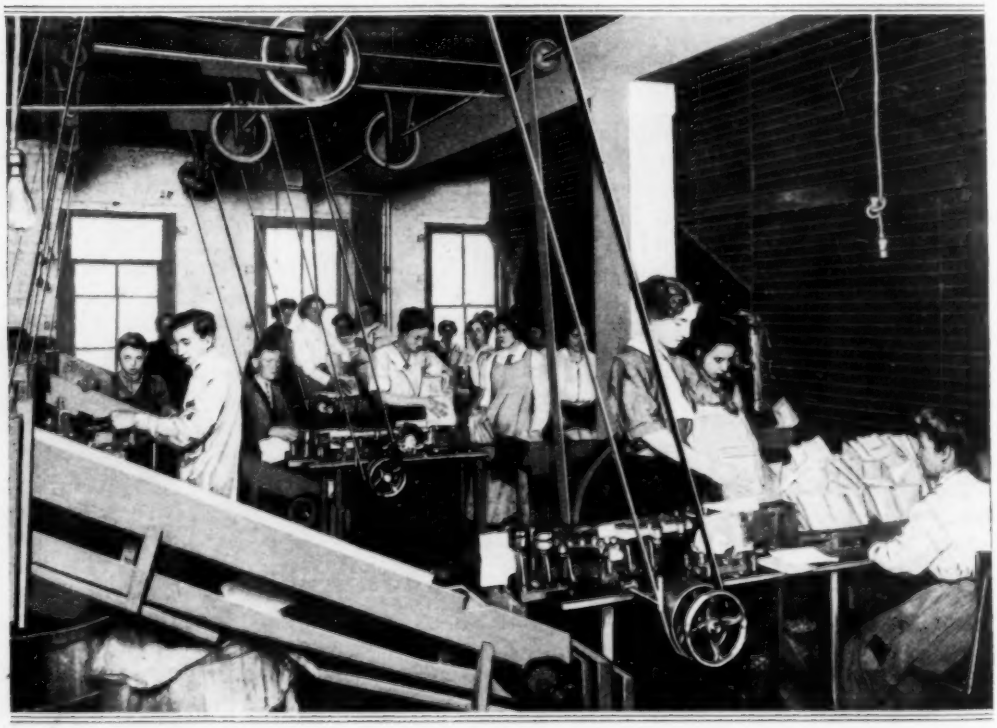
represent tens of thousands of pounds of the best seed procurable.

It is illuminating to know that the aggregate weight of the free seed circulated from Washington this spring amounted to 499.06 tons, or, for the sake of juggling figures, 15,969,920 ounces. Of this amount, it is also interesting to know, corn seed predominated, 350,000 lb. of it being mailed to various sections of the country.

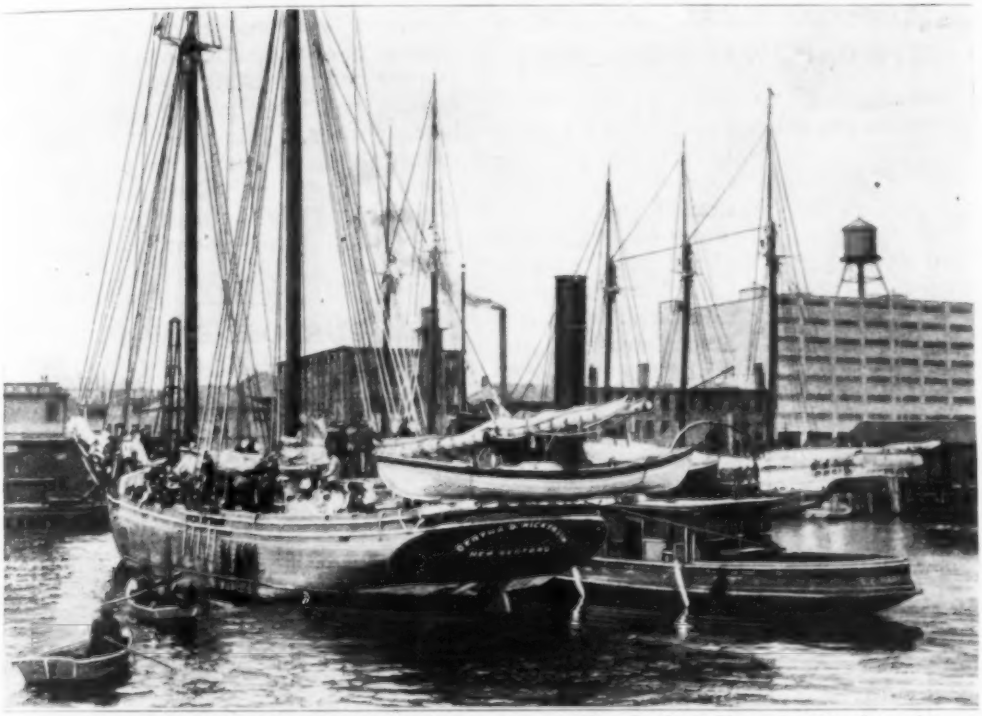
To supply the demand made upon it, the government purchases about a fourth of its seed from the surplus stocks of dealers and has the rest of it grown by contract under the supervision of the Department of Agriculture. All classes of seed are subjected to veritable third-degree tests. They begin to reach Washington in late fall and there are packed and later mailed to nearly every rural district, village, hamlet, and town in the country. Machines are used which automatically proportion the seed by weight, fill the individual packages and seal them. A battery of 20 of these machines turns out 1,250 packages a minute and is in operation from December 15 to the middle part of April. Other machines are used for sealing large envelopes containing packages of selected seeds.

WHALERS KEEP UP TRADE WITH REMOTE ISLANDS

Since the outbreak of the war, when every sort of seaworthy craft has been pressed into service, the lively trade that exists between New Bedford, Mass., and the Cape Verde Islands, west of northern Africa, has been carried on in part by former whaling schooners and private yachts. About 30 days is required to travel in these small boats to and from this Portuguese possession, and in the long voyages the same sort of skill and hardihood are often required that characterized American seamanship in earlier days. Hostile submarines greatly increase the perils.



Mailing Envelopes Containing Several Packets of Different Kinds of Seed are Conveyed to These Four Machines Which Seal Them at the Rate of 130,000 a Day

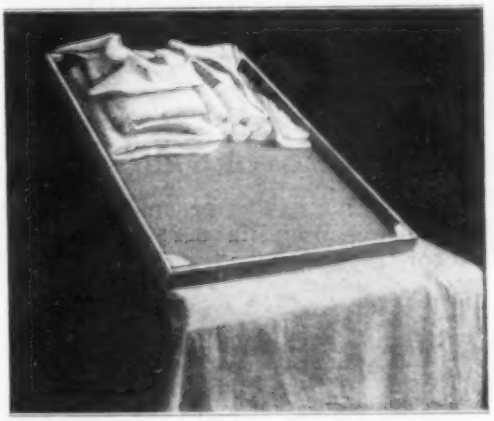


A Schooner Formerly in the Whaling Service, Arriving in New Bedford, Massachusetts, from the Cape Verde Islands after a Stormy Voyage of 36 Days

Recently one of the schooners arrived in New Bedford from the Cape Verde Islands after a stormy voyage of 36 days. The principal cause of being six days overdue was that, when 15 days out, the boat was caught in a storm that wrecked the steering gear. The resourceful sailors rigged up a tiller from poles and by means of tackle attached to either side of the boat, kept the craft under control, with two men constantly in charge during the remaining 21 days' sailing.

WOODEN TRAYS ARE AVOIDED FOR SURGICAL DRESSINGS

Because of the danger of gauze collecting splinters, trays constructed of unprotected wood are not recommended for Red Cross workers engaged in making or handling surgical dressings. One such type of tray has recently come to notice. It consists of a two by three-foot frame, made of half-inch material, to which a three-yard strip of unbleached muslin is attached. The free ends of the cloth serve as a covering for the dressings.

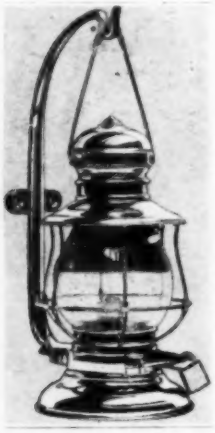


Gauze Is Prone to Pick Up Splinters, So the Wooden Frame of This Tray, Intended for Surgical Dressings, Is a Source of Danger

Trays made of wire, porcelain, pressed paper, or fiber are safest for work of this character, as may readily be appreciated. If wooden ones are employed, however, they at least should be heavily enameled.

POLISHED-NICKEL LANTERNS GIVE CAR SWAGGER TOUCH

Ornamental as well as utilitarian purposes are served by highly polished nickel lanterns intended for installation at the sides of a motor car just above the running boards which they illumine. They burn kerosene but are not easily blown out. Padlocks hold them in plain brackets where they are easy of access when needed by the tourist or camper. Particularly do they lend an effective touch to the appearance of a limousine, landaulet, or sport marine body.

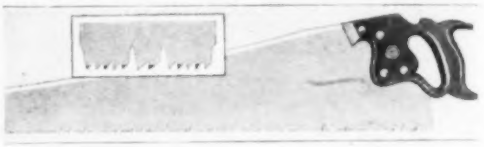


TRAVELING SHOWER BATH FOR FRENCH CHILDREN

A portable shower bath is one of the features connected with a traveling dispensary which the Red Cross has sent through the region left desolate by the Germans' retirement last April. The condition of the children in the villages is particularly pitiable, many of them having had no chance to bathe since last winter. The shower bath is mounted on a truck, its piping is of wood, rubber, and nickel, and the tub is wood. While the attending physician operates a pump a nurse scrubs the child.

ALL-PURPOSE SAW IS NEW TOOL FOR ROUGH WORK

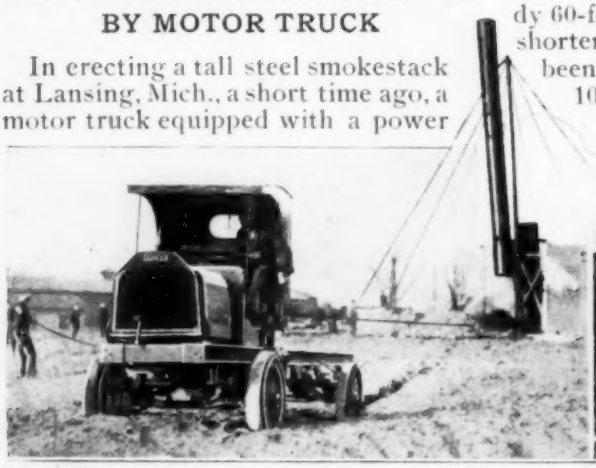
Crosscutting, ripping, and mitering are done by a new combination-tooth saw introduced for rough construction work of all kinds. The rip teeth act as cleaners when the blade is used for crosscutting. When ripping or mitering is being done, the crosscut teeth make a scoring cut on each side of the kerf, enabling the rip teeth to cut cleanly with ease and rapidity.

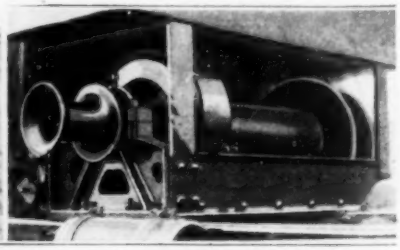


The Tooth Edge Consists of a Combination of Rip and Crosscut Teeth, a Deep Gullet Separating Each Section

HEAVY SMOKESTACK HOISTED BY MOTOR TRUCK

In erecting a tall steel smokestack at Lansing, Mich., a short time ago, a motor truck equipped with a power winch was used in elevating an unwieldy 60-ft. section of pipe to the top of a shorter length that had previously been placed. Although it weighed 10,000 lb., it was handled without difficulty, and elevated to the required height in a few minutes.





Only a Few Minutes were Spent in Elevating the 60-Foot Section of Pipe to a Height of 70 Feet. The Motor Truck, Equipped with a Power Winch Which is Illustrated at the Right, Handled the 10,000 Pound Load with Ease

A Product of the Landscape Gardener's Art: A Quarry in San Antonio, Texas, Changed into an Attractive Recreation Spot

GARDENERS CHANGE QUARRY INTO A SPOT OF BEAUTY

The skill of landscape gardeners has transformed an old quarry in a San Antonio, Tex., park from an eyesore into a spot of special beauty. Accumulated rocky refuse was employed in making an island in the pond at the bottom of the pit, while shrubs, aquatic plants, an arched footbridge, and paths with ornamental borders were employed to give added attractiveness to the unusual scene.

NEW COMPARATOR MEASURES THREAD GAUGES RAPIDLY

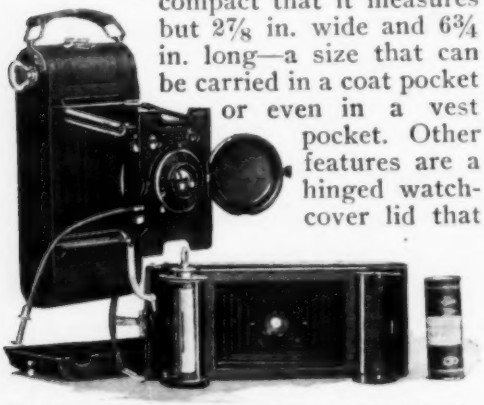
Into a new machine for measuring master plug and thread gauges, with which a manufacturer can rapidly test the accuracy of interchangeable machinery parts, has been incorporated a fluid gauge—a feature making the instrument preferable to the usual type of micrometer, it is claimed. This comparator has a rectangular base from which rises an overhanging standard supporting a movable bar and other adjustable parts, including the upper measuring points. The supports for the article to be measured consist of two parallel five-sided blocks of identical dimensions, each with their upper surfaces converging to form a straight line. The upper measuring contact is carried on the lower end of a spindle, the movement of which up

A Costly Instrument for Measuring Master Plug and Thread Gauges in Which a Fluid Gauge is Embodied; the One in the Background Is Less Expensive, Measurements being Made by the Three-Wire System

and down is registered by the fluid gauge, with which it is in contact. The latter is graduated to ten-thousandths of an inch so that the utmost accuracy can be obtained in making comparative measurements.

COMPACT FOLDING CAMERA HAS HANDY FEATURES

A new folding camera, taking pictures 2¼ by 3¼ in., has been made so compact that it measures but 2⅞ in. wide and 6¾ in. long—a size that can be carried in a coat pocket or even in a vest pocket. Other features are a hinged watch-cover lid that



A Camera Taking Pictures Two and One-Fourth by Three and One-Fourth Inches, Which can be Carried in a Small Pocket

protects the lens, and a convenient leather handle on one end. A combination carrying case and holster, with a detachable handle and belt strap, is also provided.

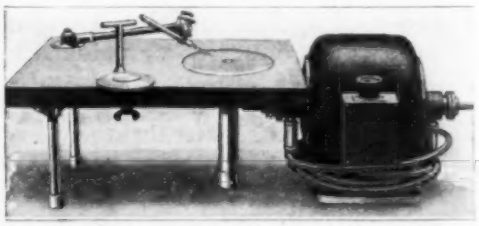
ADJUSTABLE-WEIGHT CLUB FOR PARTICULAR GOLFERS

In selecting a golf club such things as its weight and balance are of as much importance to a player as the length and degree of stiffness, or flexibility, of the shaft. Because of this, a new type of brassie, one in which the weight and its disposition in the head can be adjusted to meet individual requirements, has been designed. Countersunk in the sole, and held in place by a heavy screw, is a metal plug, the inside of which is provided with sockets in which lead slugs fit snugly. By removing certain of these members, or interchanging them, the weight and balance may be altered until the club is properly suited for its user.

By Removing or Interchanging Certain of the Slugs the Weight and Balance of the Club may be Altered to Meet Individual Requirements

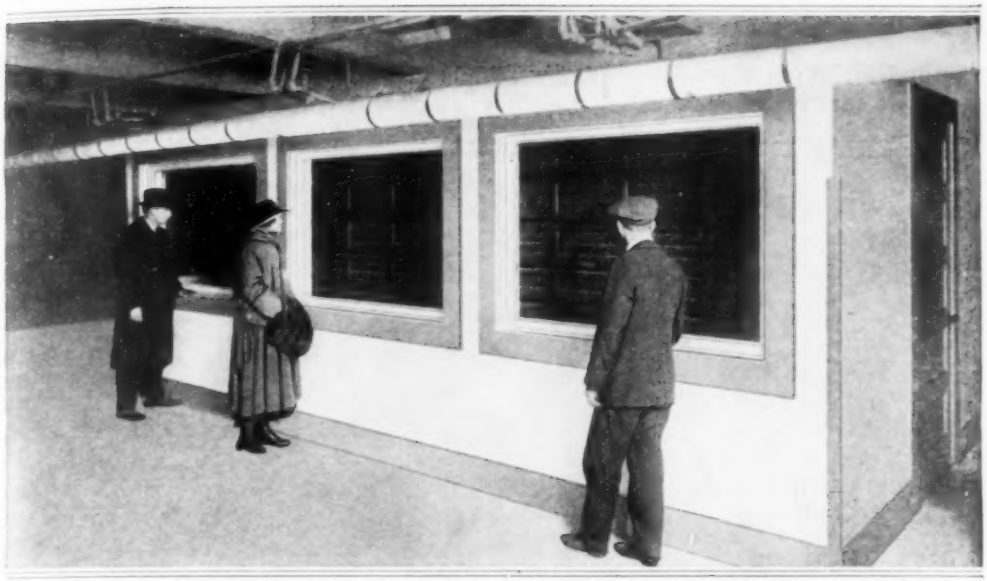
DENTAL TOOLS SHARPENED PROPERLY BY MACHINE

Of interest particularly to dentists is an apparatus for scientifically sharpening the chisels, excavators, spoons, and similar instruments used in cavity preparation. Since a true bevel, or lip, angle is as important as a keen edge, such work when done manually requires much skill. The mechanical outfit consists in part of a small table in which a disk stone turns truly when power is transmitted through a worm gear. Holders that grip the instrument and enable it to be locked at the required angle are fitted to a



The Arm Holds a Dental Instrument at the Proper Angle to Assure a True Bevel and a Keen Edge in Sharpening

swinging arm. On each instrument is a number that indicates its bevel. A guide provided with correspondingly numbered slots is situated in front of a T-shaped support on which the arm may be rested. When slipped into the proper place and locked, the tool is given the correct angle in its holder. The final adjustment is made when a sleeve and clamp are set at the proper numbers and locked. The arm is then swung to the stone, the power applied, and the sharpening undertaken.

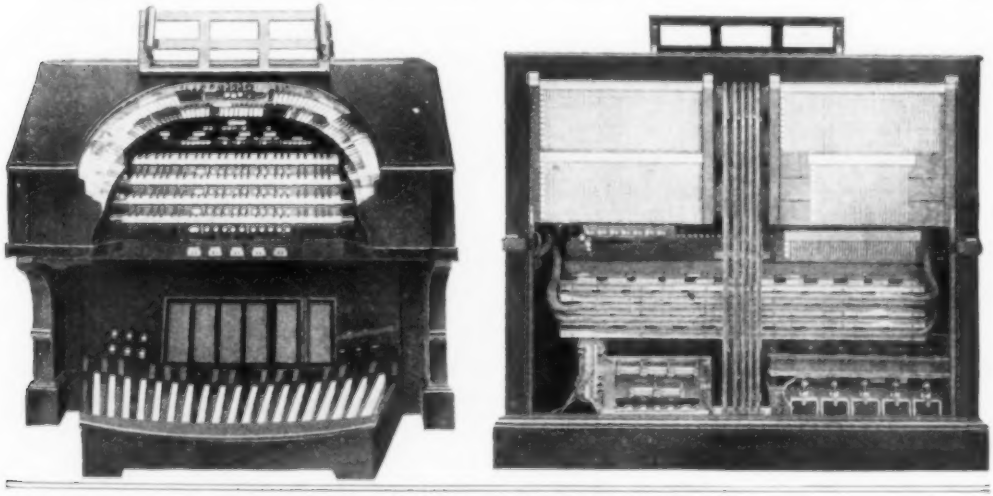


Inspecting the "Brains" of Denver's Great Organ: The Relay Room in Which 15,000 Electrical Connections for the Instrument are Centered and So Arranged That Anyone can Watch Them Function While the Organist Plays

GREAT MUNICIPAL ORGAN INSTALLED IN DENVER

An $85,000 municipal pipe organ whose size and special features make it one of the greatest instruments of its type in this country has just been installed in the Denver Auditorium, a municipal assembling place seating 14,000 persons. In it are combined the qualities of a cathedral organ and a symphony orchestra. Some conception of its size may be gained from the fact that the largest of the pipes stands two stories high, is 40 in. square at the large end, and weighs 1,250 lb., while the diameter of the smallest pipe is about that of a straw, and it weighs half an ounce.

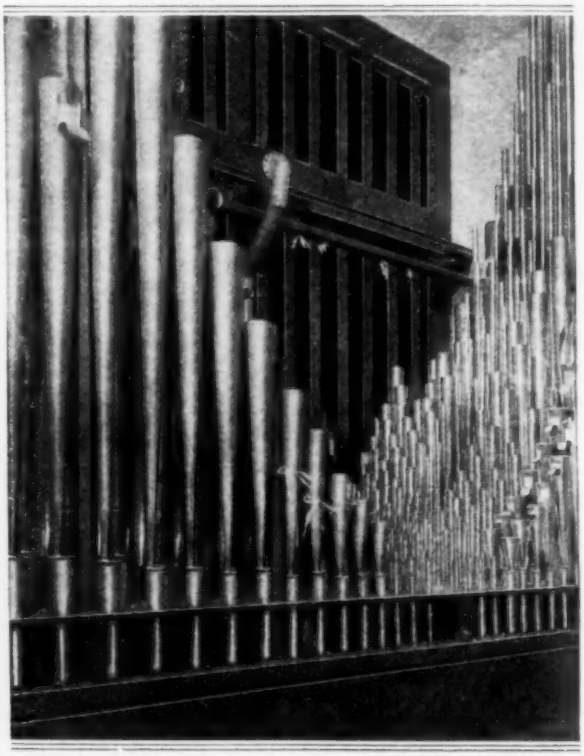
The main organ is housed in six electrically heated chambers whose temperature is kept uniform by thermostatic control. Above the ceiling of



Front and Rear Views of the Movable Console: By Depressing a Tablet Located under Each of the Four Keyboards, a Suitable Bass is Automatically Provided for Whatever Stops are Drawn on the Manuals

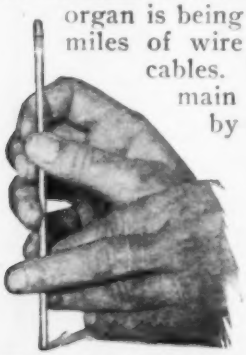
the auditorium is the echo organ, having four sets of vox-humana pipes instead of one, which is the usual number.

By means of an automatic player and the proper records, any desired composition can be played on the instrument mechanically. A grand piano is attached to the console and may be played by the organist at will. The console is mounted on a platform which can be lowered into the basement by hydraulic means when the organ is not in use.



A Section of the Main Organ with the Small Swell Shades Open: Note the Multiplicity of Slender Pipes at the Right

A distinctive feature is the relay room in the basement of the auditorium, inclosed in glass and so arranged that the operation of the 15,000 electrical connections can be witnessed while the organ is being played. Some 300 miles of wire was used in the cables. The blowers of the main organ are driven by a 35-hp. motor and those of the echo organ by a 3-hp. motor.



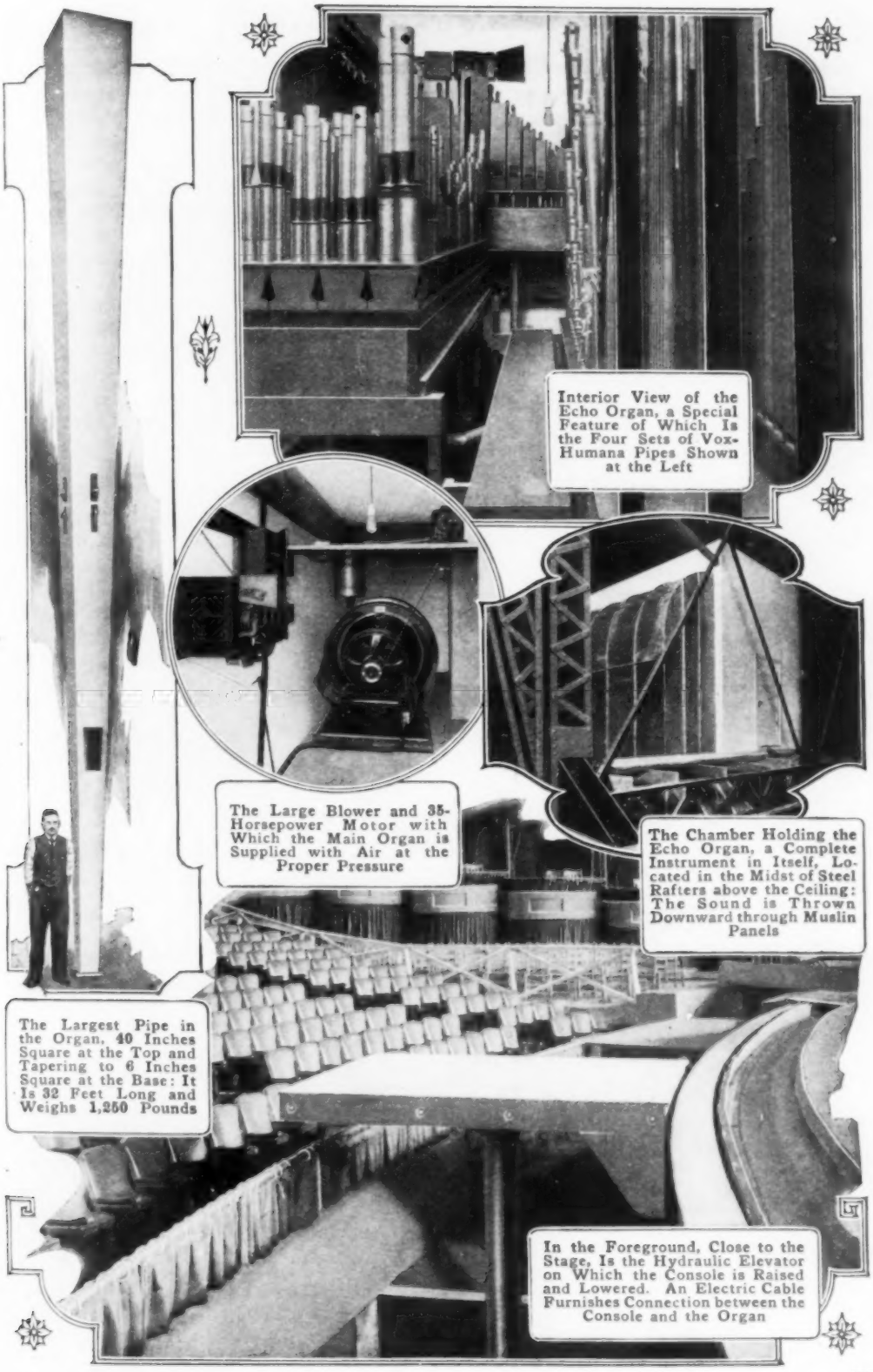
The Organ's Smallest Pipe Weighs Half an Ounce

A widely known musician has been engaged to play the organ, and it is planned to employ it in many ways for the enjoyment of the entire city. Free recitals will be given at noon during the week, and on Sunday. The great instrument will also be used in connection with programs by a municipal chorus of over 1,000 voices.

The success with which orchestral effects can be produced makes the organ particularly suited for giving recitals of a popular character, as well as for accompanying large bodies of singers. With it rich tones can be produced that are wonderfully like the violin, and the flute, clarinet, and oboe are simulated in an equally striking way, while the mighty tubas and the diapasons furnish tone color that is pronounced truly impressive. So completely is the organ under the control of the player that at his will its volume can be reduced to accompany the human voice.

NEW PROCESS OF DYEING SEALSKINS

An American concern engaged in preparing Alaska sealskins for the market has developed a process of dyeing the skins which is pronounced superior to any previously used. About two years ago the firm brought 15 men to this country from England who were skilled in unhairing, dressing, dyeing, and machining sealskins, and since then the process referred to, which is a secret, has been developed.



Interior View of the Echo Organ, a Special Feature of Which Is the Four Sets of Vox-Humana Pipes Shown at the Left

The Large Blower and 35-Horsepower Motor with Which the Main Organ is Supplied with Air at the Proper Pressure

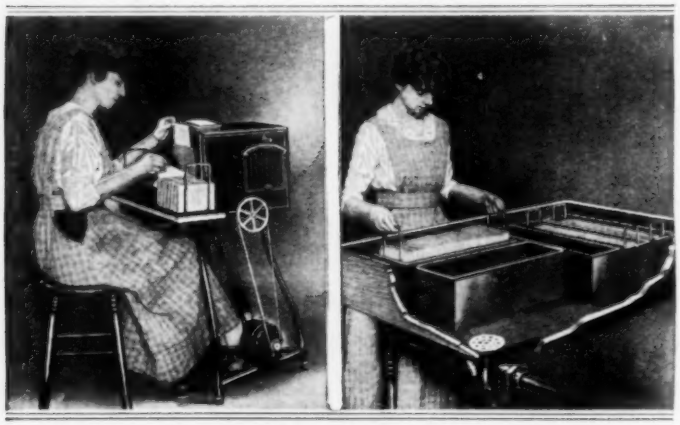
The Chamber Holding the Echo Organ, a Complete Instrument in Itself, Located in the Midst of Steel Rafters above the Ceiling: The Sound is Thrown Downward through Muslin Panels

The Largest Pipe in the Organ, 40 Inches Square at the Top and Tapering to 6 Inches Square at the Base: It Is 32 Feet Long and Weighs 1,250 Pounds

In the Foreground, Close to the Stage, Is the Hydraulic Elevator on Which the Console is Raised and Lowered. An Electric Cable Furnishes Connection between the Console and the Organ

HIGH-SPEED OUTFIT PRINTS AND FIXES PHOTOS

Twelve hundred prints an hour is the capacity of a photographic printing machine that has been developed for large-quantity commercial work. Unlike most other apparatus of the kind, its output is not determined by the density of the negative in hand. The intensity of the light, rather than the length of the exposure, is varied to meet different conditions. As the sheets of sensitive paper are removed from the machine after exposure they are placed in a rack provided immediately in front of the operator. When filled, the holder, which receives 100 prints, is placed successively in the developing, rinsing, and fixing tanks so that finishing is as speedy as the printing.



As the Picture to the Left Makes Clear, the Prints are Placed in the Rack as They are Removed from the Machine. Development and Fixing are Accomplished as Shown at the Right

POWERFUL GRADING OUTFIT HAS REVOLVING DIGGER

A remarkable grading machine, which, it is claimed, does the work of 125 men, cutting a smooth path, 5 ft. 7 in. wide and as much as 2 ft. deep, is now being built to order for large contractors. Because it will rip out old macadam, or moist clay, about as easily as gravel, it practically standardizes grading costs, according to the makers, at the same time affording much needed relief from conditions caused by the labor shortage. The digging is accom-

Grading a Road with a Machine Which, It is Claimed, Does the Work of 125 Men

The Dirt Falls onto an Endless Conveyor Which Discharges into Wagons or Trucks Drawn alongside the Digger

plished by means of a rotating cylinder on which are mounted 12 buckets having sets of cutting members on their edges. Loosened dirt tumbles back into the buckets and is then discharged onto a belt conveyor which can be extended either side, to deliver material to wagons brought alongside. The machine travels on sets of endless treads composed of hinged planes. Complete control centers in the operator's cab, from which the cutting wheel is raised and lowered and the machine sent forward at any one of three speeds, or reversed.

GYPSUM TILES FOR ROOFS OF INDUSTRIAL PLANTS

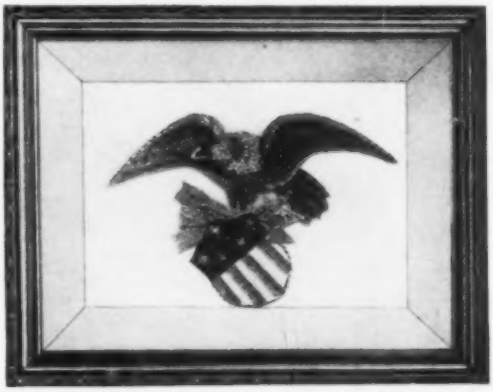
Many builders of fireproof industrial plants and similar structures are now employing gypsum tiles of the type illustrated herewith in the roof construction. These tiles afford a span of 4 to 8 ft., they are 2 in. thick except at the

Roof Tiles, for Industrial Structures, Made of Gypsum: They are Cast in Wooden Forms and can be Erected the Same Day As Molded

ends and along the center, where there is a reinforcing rib. Wire and round rods are used in the steel reinforcing. The material used is extra-dense, double-strength gypsum. One advantage which this building material possesses is that it can be molded on the job and erected the same day.

USE THOUSANDS OF STAMPS IN PATRIOTIC DESIGN

More than 25,000 canceled United States stamps have been used in constructing a patriotic design representing an eagle with spread wings, perched on a shield. The task occupied the maker's spare time for 11 years. Instead of placing the stamps flat they are rolled into cornucopias. This extraordinary piece of handiwork is 5½

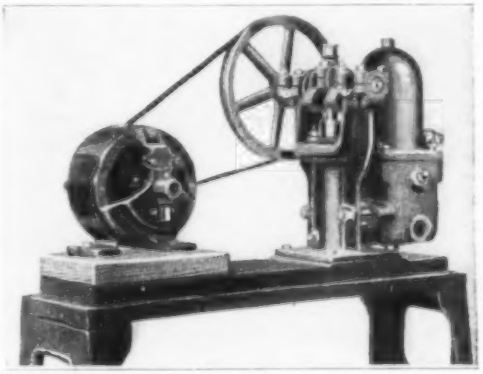


Patriotic Design Made Up of Over 25,000 Canceled Stamps: The Work Occupied the Maker's Leisure during Eleven Years

ft. wide, and 4 ft. high, and nearly a foot deep. By using stamps whose denominations vary from the lowest sums to $400 all the desired shades of color were obtained.

QUIET WATER-SUPPLY PUMP FOR PRIVATE SYSTEMS

By the elimination of all gears, a noiseless water-supply pump of small capacity has been developed. At a distance of 10 ft., it is claimed, the only sound to be heard is the hum of the motor. It operates at a speed of 500 revolutions a minute and therefore can be belt-driven. The pump is supplied with an air cock and is used with either open or pressure-tank systems.



The Pump Operates at High Speed and may be Belt-Driven from Either an Electric Motor or Gasoline Engine

UTILIZE SPECIAL DEVICES TO UNLOAD FROZEN COAL

The task of unloading carloads of frozen coal during the bitter weather of last winter frequently proved about as difficult as digging the fuel in the mines. At points in the East pneumatic tampers used by railroad trackmen were equipped with special pick-like points and served as excellent tools in breaking up the coal which had congealed into a solid mass. Another method was to inject steam into each car of fuel by means of 10 or 12 steam pipes driven well down into the load and deriving steam from a main alongside. In some cases whole trainloads of coal were thawed out at once in this way, when the mercury stood well below the zero mark.

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A Train of Gondola Cars Loaded with Frozen Coal Which is Being Thawed Out by Injecting Steam into It from Numerous Pipes

"Mining" Coal in the Cars with Pneumatic Picks. Right: Pneumatic Tools Equipped with Pick Points for Loosening the Coal

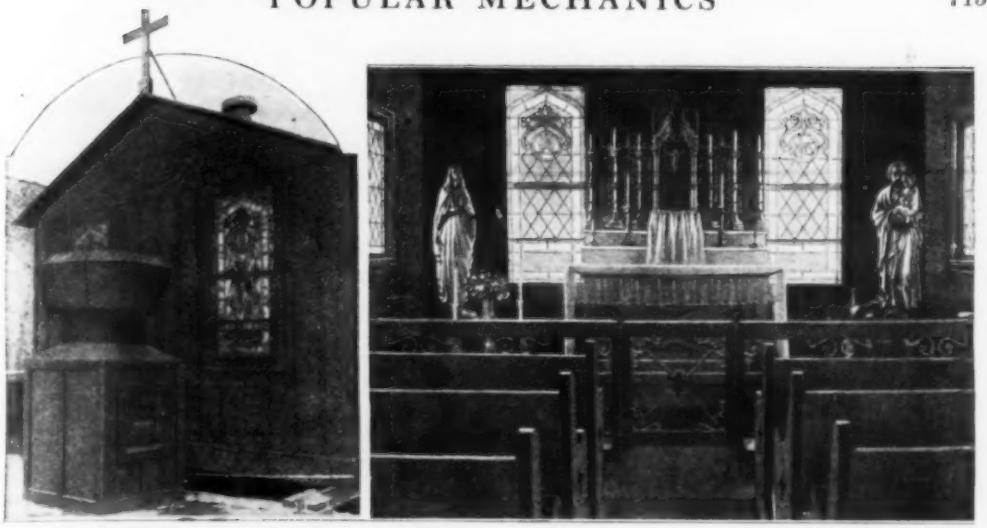
NO SMALL SHIPS ALLOWED TO CROSS ATLANTIC

The shipping board by a recent order has forbidden all vessels of 2,500 tons' dead weight, or less, to engage in transatlantic shipping. About 1,400 ships of various sizes are included in the order. Many of these have been operating in opposition to those taken over by the government and have been charging rates which are exorbitant. The order has been issued to effect conservation of tonnage, the belief being that the small craft cannot be operated economically or with safety between America and Europe. The steamships affected will be used in coastwise, West Indies, and other service.

NOW CROSS SOUTH AMERICA BY RAIL IN A WEEK

Train service has recently been announced which makes it possible to take the 1,900-mile journey across South America from Buenos Aires, Argentina, to Arica, Chile, in seven days. A portion of one day's travel is by motor. In the schedule which has just been put into effect only three of the nights are spent on the train. Dining-car and sleeping-car service is offered, but travelers are warned not to expect Pullman-car conditions, particularly in mountainous sections of Argentina and Bolivia. They are further advised that warm clothing should be taken, as the cars are not heated. The fare for the entire journey is about $85 in United States currency.

¶ An appropriation of $6,000,000 to be used in establishing a Philippine merchant marine has recently been approved by the government at Manila.



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A Diminutive Church Erected on a Hospital Roof for the Convenience of Patients and Others: The Object in the Foreground Is a Ventilator. Right: Interior View of the Little Sanctuary Taken from the Entrance

DIMINUTIVE CHURCH BUILT ON HOSPITAL ROOF

A diminutive church which undoubtedly can be classed as one of the smallest in the world, is located on the roof of a New York hospital, where patients and others worship away from the noise. The furnishings are all in proportion to the small structure, the light bulbs and the stations of the cross, for example, being of miniature size. The little edifice will seat 40 persons.

CLEAR STREETS OF SNOW WITH STEAM SHOVEL

The heavy snowstorms of the past winter taxed to the utmost the street departments of many cities. In Newark, N. J., where laborers were scarce, the difficulty was overcome by using a steam shovel. By employing enough wagons to form a continuous line moving past the machine, it was found that it could be operated at about one-third the cost of hand labor.

Clearing a Street of Snow in Newark, New Jersey, with a Steam Shovel: The Machine Did the Work of a Large Force of Men at About One-Third the Cost

AN INTERESTING AERIAL FIGHT

By DAVID RIPLEY

When the Machine Plunged into a Plowed Field Back of the Lines, the Motor Sank in the Soft Ground to a Depth of More than Three Feet. The Pilot was Killed but the Observer Appeared Only to be Dazed

LAST summer I had the opportunity of seeing a very exciting air fight between a French scouting plane and a large German battleplane. We had seen many of these during the summer, but this one impressed me most, because it happened right over our heads and the wrecked German plane fell within a short distance of our cantonment.

We first noticed the planes circling

Blood-Stained Inspection Tag Taken from the Wrecked Plane: It Limits the Maximum Load to 580 Kilograms, or 1,276 Pounds

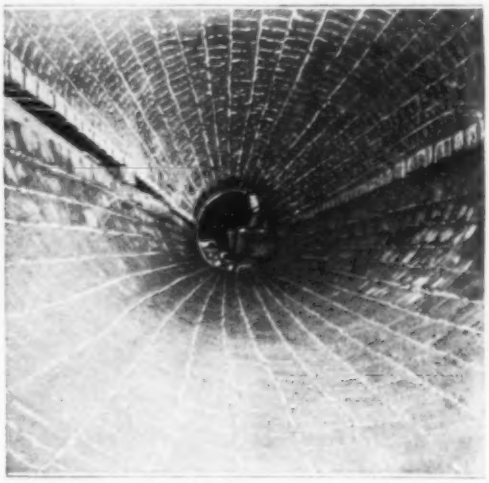
over the lines, by the tiny puffs of shrapnel bursting around them. When the guns found their range they would take long nose dives and reach a lower level where they could circle about without any chance of being hit. As the planes neared each other, the batteries on both sides ceased firing, in order not to take any chance of bringing down their own man. The Boche began climbing up in long spirals, and before the French plane could get away, he was directly over him, and began to make a final dive with his machine gun wide open. The Frenchman caught himself just in time and started down also, ending up in a great loop which brought him above the German and so reversed the chase. The German tried the same trick of rising in a sudden swoop, but, losing control of his machine, began to drop, with the Frenchman following close behind. The German went straight for earth, but the French plane righted itself and landed in a near-by cornfield.

By the time we arrived at the spot, a great crowd had gathered around the battleplane, everyone joining in the mad scramble for souvenirs. The plane had landed in the middle of a plowed field and the engine had gone over three feet into the soft earth. The pilot had been wounded in the arm by a bullet and had probably lost control of the machine. He was dead when the machine landed and his body was so tangled up in the wreckage, that his legs had to be amputated before he could be removed. The observer, who sat just behind him, was apparently unhurt, although somewhat dazed after the fall. The plane was one of the largest the Germans have, equipped with three machine guns and a nine-cylinder Benz-Mercedes motor, capable of attaining a speed of 120

miles an hour. All the various parts of the machine were made in Germany, except the landing tires, which were of American make. The aeroplane had been built that year and showed all the latest developments in fighting machines.

STRONG CONCRETE SEWER MADE IN SPECIAL WAY

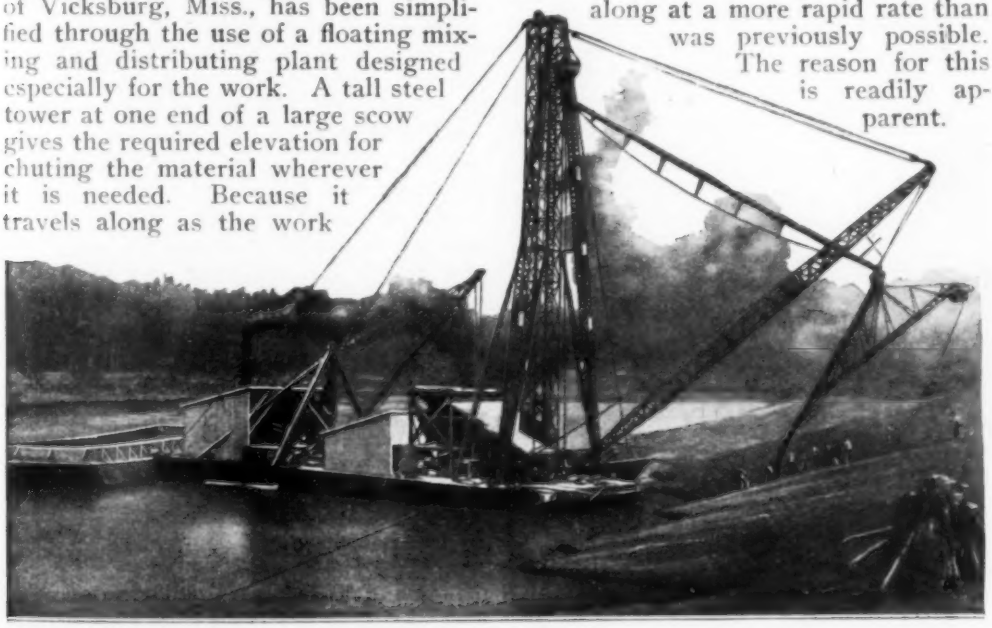
The requirement that a large concrete sewer, lined with brick, be made without longitudinal seams, or joints, in any of its sections, because it would be subject to heavy pressure from within, necessitated an uncommon method of construction. When the forms had been set in place, the upper half of the brick lining forming the arch, was constructed and the iron reinforcing installed. The concrete was then poured, making a complete cylinder. After it had set sufficiently the remaining brick, lining the inverted arch, were laid. One course on each side, constituting a key, was omitted until the last.



Interior of Brick-Lined Concrete Sewer: The Outer Concrete Shell Forms a Cylinder without Longitudinal Seams or Joints

FLOATING CONCRETE PLANT FOR BANK REVETTING

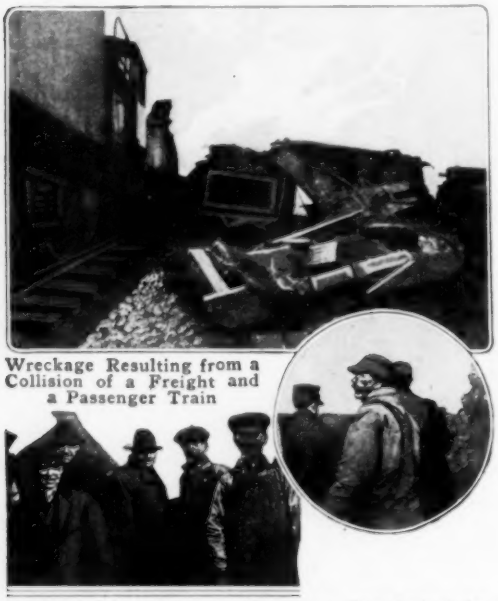
Construction of concrete revetments along the river banks in the vicinity of Vicksburg, Miss., has been simplified through the use of a floating mixing and distributing plant designed especially for the work. A tall steel tower at one end of a large scow gives the required elevation for chuting the material wherever it is needed. Because it travels along as the work progresses, the outfit has proved highly efficient and allowed operations to go along at a more rapid rate than was previously possible. The reason for this is readily apparent.



The Scow Carries a Mixer at One End and Supports the Distributing Tower at the Other. It has Proved Valuable in the Construction of Concrete Revetments

WRECK HAS COMIC ASPECT BECAUSE OF LAMPBLACK

There is seldom a humorous aspect to a railroad wreck, but when it was found that a recent collision of a freight



Wreckage Resulting from a Collision of a Freight and a Passenger Train

Passengers and Crew with Faces Besmirched by Soot That Rose from the Wreckage

and a passenger train had injured no one seriously, but had damaged an express car and scattered its contents, a comic aspect of the affair developed. The damaged car contained many pounds of lampblack in paper bags, so badly broken that the air was filled with soot. The faces, hands, and clothing of all who came near took on a dusky hue, while the rain that was falling served to make more laughable the appearance of those passengers and trainmen that tried to rub the black from their faces.

ACTION DEMANDED FOR HELL GATE CHANNEL PROJECT

Vigorous efforts are being made by the city administration and business interests of New York to prevail upon the government to expedite the work of widening, straightening, and deepening Hell Gate channel. The campaign is being waged for both commercial and military reasons, and stress is laid particularly on the necessity of giving the passage a depth of 40 ft., instead of only 35 ft. as proposed by army engineers. Action is also urged on the associated project of removing Shell Reef, extending from Corlears Hook Park to Thirty-Third Street, which prevents the development of docks and piers that are badly needed along the East Side of Manhattan. A delegation headed by Mayor Hylan and composed of representatives of the leading commercial organizations, recently made an appeal direct to the president. They argued that New York is a national port rather than a local one, and that failure immediately to develop its facilities hampers the country's commerce. A 40-ft. channel would give the largest naval vessels a passageway between New York Bay and Long Island Sound.

COMPOUND PENHOLDER BUILT IN PORTABLE CASE

To conserve his time a man, whose monthly duty it is to sign 100,000 salary checks for a railway company, employs a multiple penholder that permits his signature to be written five times in one operation. The apparatus differs from some others in that the fountain pens are clamped to a pivoted rack that is mounted in a portable box resembling a suitcase. The cover, when opened flat on the desk top, holds a frame in which the vouchers are placed for signing. The operation of the device is like that of similar ones.

Signing 2,000 Pay-Roll Vouchers an Hour with the Aid of the Multiple Penholder

Delivering Water by the Pailful to a Householder Whose Water Pipes were Frozen. Right: Children Obtaining Water for Their Homes from the City Sprinkling Tanks

PEDDLE WATER TO HOMES WHEN MAINS FREEZE

When the frost last winter went to the almost unprecedented depth of 5 and 6 ft. in various New England towns, it froze many water mains solid, and water became a very precious commodity. Municipal authorities got out their sprinkling tanks, mounted them on sleds, and delivered water from house to house. Plumbers worked night and day thawing out and repairing pipes. One man who rigged up a steam-thawing outfit was kept on the go with it in spite of his charge of $15 for each pipe released from the grip of the frost.

USE BASALTIC LAVA IN FILTER BEDS

Basaltic lava, obtained in certain parts of Rhenish Prussia, is being used in Germany in filter beds for sewage plants, after being properly prepared, and is considered cheaper than kieselguhr, which it displaces. The lava is ground to a certain fineness and treated with hydrochloric acid, or with soda lye, after which it is baked, rendering it more porous. It has been suggested that the vast beds of basaltic lava to be found in our own Northwest might be utilized profitably in a similar manner.

THREE TANKS COMBINED IN ONE WATER TOWER

A concern, finding that its factory foundations were insufficient to support sprinkler-system water tanks and that all its available land was soon to be occupied by an addition, constructed an unusual steel water tower. It supports three tanks and its four uprights are so placed that they can be incorporated into the addition. The upper container is a large pressure tank for fighting stubborn fires. The other two, suspended beneath it by rods, are pressure tanks for putting out smaller conflagrations. The two lower tanks were eventually inclosed in a concrete housing.

AIR-BRUSH PAINT TANK CARRIED ON THE BACK

A new commercial painting outfit of the air-brush type is provided with a paint container that straps to the work-

Painting Big Gun with a New Portable Air-Brush Outfit: The Air is Compressed by the Engine at the Extreme Left

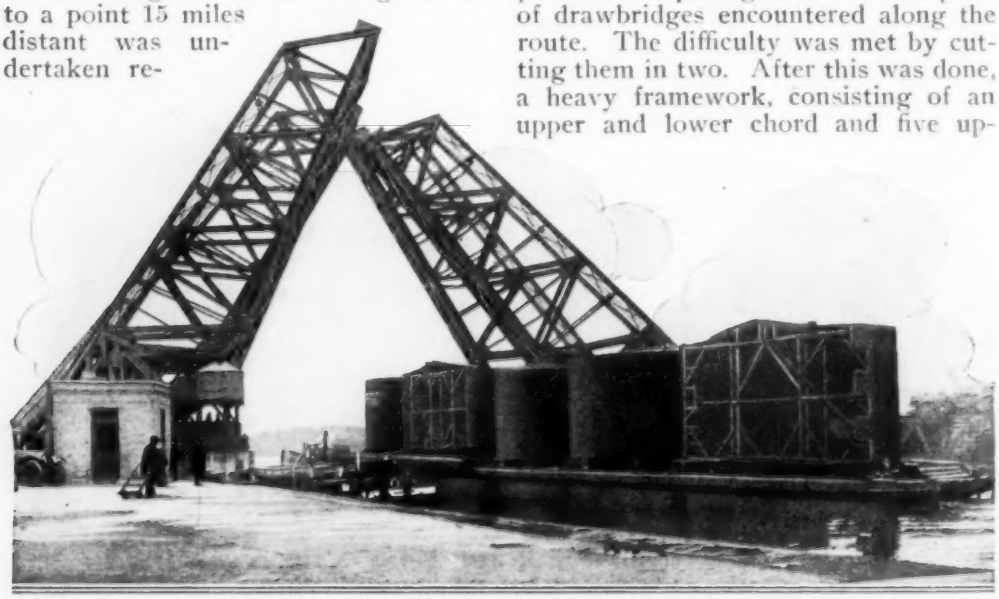
er's back like a knapsack, giving the operator an unusual degree of freedom. It is well suited to military uses, such as camouflage work.

MINES MENACE WHALES IN NORTH SEA

The recent experience of a fisherman on the coast of Norway shows that numerous mines floating in the North Sea and Skager-Rak are a menace to the creatures of the deep as well as to ships. This man sighted a dead whale floating near the mouth of the Christiania Fjord and immediately made for it, well aware of its value because of the current high prices paid for all kinds of fats. With some difficulty he got a cable around the body and towed it to shore, where he found that half of the creature's head had been blown away, in all probability by accidental contact with a mine. Although the whale was rather small, being but 26 ft. long, the lucky fisherman realized over $1,200 from the sale of his unusual prize, the blubber being among the most valuable materials obtained.

BIG STEEL TANKS ARE CUT IN HALF FOR RIVER TRIP

When the task of moving 24 large steel tanks from South Chicago via Lake Michigan and the Chicago River to a point 15 miles distant was undertaken recently, it was found that a number of them were too great in diameter to permit their passage between the piers of drawbridges encountered along the route. The difficulty was met by cutting them in two. After this was done, a heavy framework, consisting of an upper and lower chord and five up-

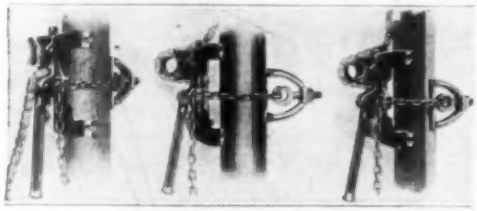


In Order for Them to Pass between Some of the Bridge Piers Encountered along the Route, It Was Necessary to Bisect Several of the Largest Tanks and Brace Them as Shown Here

rights, constructed of 6 by 8-in. timbers, was built across the open side of each of the halves to serve as bracing. When the falsework was in place, four wire cables were stretched horizontally across the opening of each member and made taut enough to draw the steel walls against it. The divided tanks were then placed on barges and moved without further trouble to their destination, where they were reassembled.

PIPE VISE THAT ATTACHES TO POST OF ANY SIZE

Of special convenience in laying conduits, and the like, is a new pipe vise that can be readily attached to any vertical or horizontal post by means of a chain passed around the support and made taut by adjusting an eyebolt through which the chain passes. The pipe, or rod, to be gripped is put in place against the jaws of

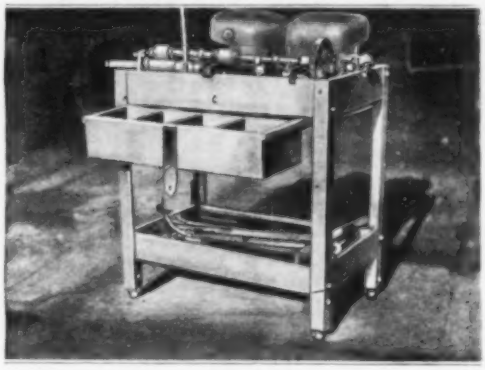


Left: Vise Attached to Round Post with Pipe in Place in Second View. Right: Vise Attached to Corner of Square Post

the implement and a strong chain, which is provided, is looped about it. A downward movement of a lever draws the chain tight, rendering the pipe or rod immovable.

"GARAGE WAGONS" SAVE MECHANICS' TIME

To assist mechanics when overhauling and repairing cars, a service station in one of the large cities has been equipped with a number of specially built "garage wagons." These are mounted on casters so that they may be moved readily from place to place, and are supplied with substantial trays and compartment drawers. As parts are removed from a machine they are placed on one of the wagons, instead of being scattered on the floor. When

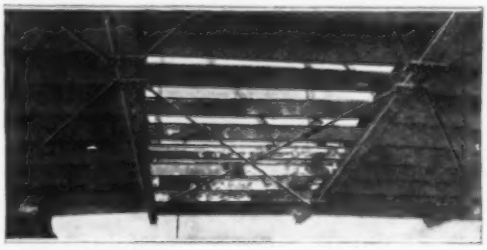


As Parts are Removed, When Overhauling a Car, They are Placed on One of the Wagons So That When Later Wanted They Are at Hand

the work of reassembling begins, everything is at hand.

STEEL IN VIADUCTS EATEN AWAY BY ACID IN SMOKE

Costly repairs now in progress on certain viaducts over railways in Chicago reveal the fact that the action of the smoke from the engines passing beneath the structures eats away the steel with astonishing rapidity. Sulphuric fumes, together with the steam that is caught beneath the elevated roadways and condensed on the under surface, are believed to be responsible for the deterioration. A new bridge constantly exposed to the action of the smoke needs repair in about six years, it is said. Where



View from Below of Bridge being Repaired: The Steel Beams are Eaten Through in Many Places

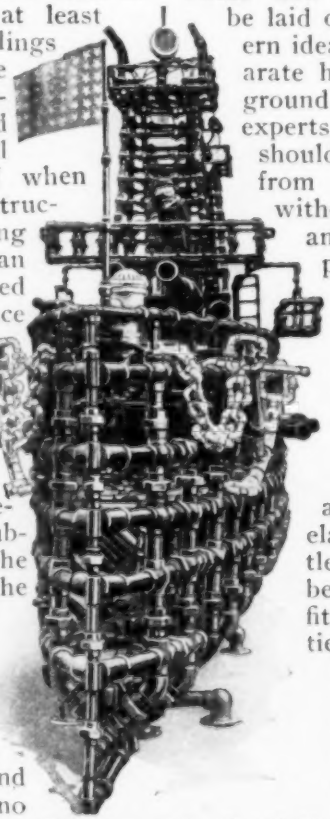
there are curved tracks under wide viaducts it has been found that the line of worst erosion follows the curve of the track, showing clearly that the

smoke is the cause of the damage. In places, the acid has completely eaten through heavy steel beams at the point where they enter concrete. The damage done in this way by locomotives in Chicago amounts to many thousands of dollars annually. Various paints have been tried as a protection, but are practically valueless. A coating of concrete is considered most effective, but in places where the structures are low, the steam and cinders from the smokestacks strike the hard concrete with such force that it is soon worn away. It is stated that structures which, in a city, over much-used tracks, will last only a few years, would stand intact for perhaps 100 years, if located in the country. Some of the older viaducts in Chicago are not built strong enough to hold a coating of concrete, and so long as they remain in use, it will be necessary to repair them every few years.

¶The South African diamond output last year, valued at over $37,000,000, totaled 2,902,000 carats, which is an increase of 556,000 carats over the previous year, according to reports.

BRITISH HOUSING PROBLEM AGGRAVATED BY WAR

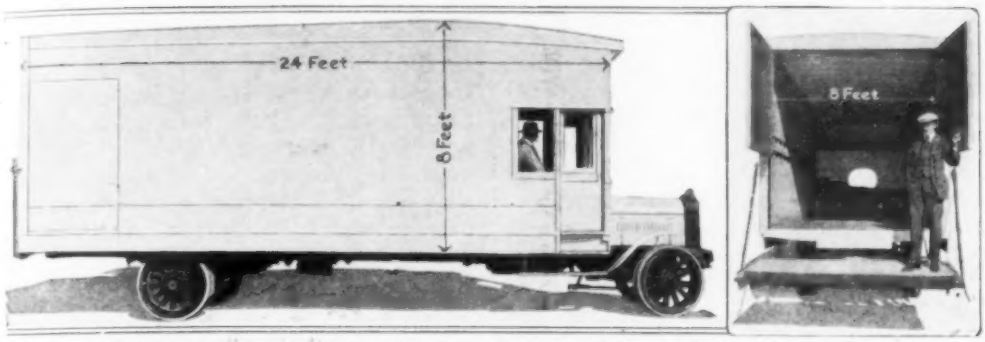
British after-war housing plans, according to an official statement, contemplate the erection by the state in England and Wales of at least 300,000 small, artistic dwellings to be rented at moderate rates to the working classes. The needs in Scotland are also pressing and will call for immediate relief when peace is established. Construction of all kinds, involving an expenditure of more than $2,500, has been prohibited in the United Kingdom since the opening of hostilities, excepting, of course, the erection of government buildings and those needed for war purposes. The situation has thus become quite serious, and has been the subject of much study by the technical committee of the national housing and town-planning council. That body has completed a report in which it is asserted that the construction of 200,000 urban and 100,000 rural houses will no more than meet the shortage due to the suspension of building operations during the war. Such a program therefore will leave the general problem untouched. These new residential areas are to be laid out in conformity to modern ideas, and the number of separate houses to the acre of city ground is to be limited to 12. The experts assert that no house should be more than 300 yards from a playground, accessible without crossing a main street, and that there must be plenty of other open places and recreation plots provided in the general plan.



Bow View of the Remarkable Model of the Battleship "New York," Which Consists of 6,669 Separate Pieces of Pipe Fittings, Valves, and Specialties

MODEL OF WARSHIP BUILT OF PIPE FITTINGS

By exceedingly skillful and painstaking work, an elaborate model of the battleship "New York" has been built of standard pipe fittings, valves, and specialties. The "boat" has an overall length of 186 in., a 34-in. beam, and a height of 102 in. It weighs 3,308 lb. and consists of 6,669 parts. At the touch of a button its propeller turns, searchlights flash, guns discharge, and wireless sputters.



Motor Van, 24 Feet Long, with a Body Eight Feet Wide and Eight Feet High: The Driver's Seat is Entirely Inclosed. Right: Interior of Mammoth Van Showing the Recess above the Driver's Seat

BIG MOVING VAN MEASURES TWENTY-FOUR FEET LONG

A motor moving van which looks almost as big as a box car has recently been put into service in the West. It measures 8 ft. wide, 8 ft. high in the clear, and 24 ft. long, and its makers claim that it is the largest van of its kind ever built. The driver's seat is entirely inclosed. A special feature is the recess above the seat, which is accessible from the interior of the car and is especially suited for holding fragile articles.

MANY WOULD-BE POLICEMEN FAIL IN REVOLVER TEST

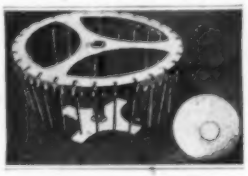
Applicants for positions on the Portland, Ore., police force are required to hit a 10-in. target at least seven times out of 10, at a distance of 60 ft., or they are disqualified. In recent tests held in

Applicants for Positions on the Portland, Oregon, Police Force Shooting at 10-Inch Targets 60 Feet Away

an indoor range, 104 men sought appointment and of that number only 75 passed the revolver trials.

PRACTICE PUTTING "HOLE" FOR GOLF DEVOTEES

Among the new accessories for golfers there is a rather novel putting cage suitable for the living-room rug or closely cropped lawn. It might be described as an "inverted hole," 2½ in. in height and 4½ in. in diameter. A small pedestal supports a horizontal ring, about the circumference of which, loosely pivoted, is a series of short wires extending downward to within a half inch of the level of the base. These members swing inwardly, when struck, and cage a ball. The effect of too strong a putt, or that of a "ringer," can be imagined.



AGENT DEVISES APPARATUS FOR ANNOUNCING TRAINS

A station agent in a small town in the middle West has installed a very serviceable apparatus which simplifies for him the task of announcing trains. It consists of a telephone transmitter connected with receivers installed in two phonograph horns, one in the men's and the other in the women's waiting room. When a train is about to arrive, the agent announces the fact through the transmitter installed on the wall of his office, and persons in all parts of the building hear him without any difficulty.

THE BUSINESS OF WAR

By E. T. BRONSDON

IN the latter part of September, 1914, a laughing, light-hearted boy, just leaving his teens, enlisted in the Canadian Light Infantry—the "Princess Patricia's." He knew nothing whatever of military science and even less of discipline, and was one of the rawest recruits at Val Cartier Training Camp.

In the summer of 1915 this same boy, changed to Damascus temper in the forge of war, commanded his regiment in the fiery hell of the second battle of the Ypres salient, one of the three bloodiest engagements of the war. He received his "D. S. O." after this was over.

As a reward for the capture of Paschendaele Ridge, eight months later, he was given an honor bar to his D. S. O. and promotion. At present he is an acting brigadier general, and doubtless will attain that rank shortly. His actual rank is that of major, but by his brother officers and all of the rank and file he is known affectionately as "Hughie" Niven of the Princess Pats.

The civilian mind is naturally loath to look upon war as anything but a monstrous business, but admitting all of its horror and the incompatibility of large-scale warfare with the ideals of modern civilization, the fact remains that war—for the individual—*is* a business in which promotion pays both in honor and in money. It is a business in which any intelligent young American can get to the top—provided, of course, that he is physically capable of being a soldier at all—if he is willing to devote half as much study and effort to advancing as he would put in upon a desk job back at home.

Rank and pay in the American army is as follows:

Privates and Noncommissioned Officers	Per Month
Private	$30
Corporal	36
Sergeant	38
Battalion Sergeant Major	45
1st Sergeant	51
Regimental Sergeant Major	51

Commissioned Officers	Per Year
2nd Lieutenant	$1,700
1st Lieutenant	2,000
Captain	2,400
Major	3,000
Lieutenant Colonel	3,500
Colonel	4,000
Brigadier General	6,000
Major General	8,000
General	10,000

"Hughie" Niven's advance in salary, granting that by the time this article is published he has

"It is a business in which any intelligent young American can get to the top . . . if he is willing to devote half as much study and effort to advancing as he would put in upon a desk job back at home."

received his expected promotion, is equivalent to an advance from $360 a year to $6,000 a year, speaking in terms of the rate of pay in the American army. All in the space of three years' time!

In the great American training camps where our national army is being trained there doubtless will be hundreds of young men who will leave positions of responsibility, places that pay better even than their equivalents in the army. These, however, are exceptions. The average salary received today by Americans between the ages of 21 and 30 is only slightly more than the pay of a first sergeant. For every one of these the war is a tremendous business opportunity!

We are not arguing that if a man were to be given his choice of carrying a rifle or carrying a pick in normal times, he would be unwise in not choosing the firearm. Times are not normal, and tens of thousands of men are being taken, willingly or unwillingly, for the army. These men, most of them with no military knowledge whatsoever, all have the alternatives before them of working blindly—for war is hard work indeed—or of striving intelligently to advance just as they would strive in a civilian occupation. The chance is there.

What chance has a drafted man at a commission? Every chance in the world! The ordinary procedure is this: A company of rookies starts drilling at a draft camp; from the first day the captain and his lieutenants are watching the men carefully to detect earmarks of intelligence and capability. Why? They are looking for noncommissioned officers. It is up to them to pick one corporal out of each eight men, and then several sergeants out of the list of corporals, and they perform their duty with the utmost care. They have to. On the basis of this first selection rests the efficiency of their commands.

Time goes on. The corporals and sergeants, if they are wise, study a little each day. Before even leaving the draft camp two or three men in each company may have shown such adaptability and intelligence that the captain recommends them for commissions. Many changes occur, due to the organization of new units and the calling of new drafts. Many new commissioned officers are needed, and only a fraction of these can be supplied by the reserve officers' training camp. Men who came in as raw privates sometimes are held over to be regimental first sergeants of new units. They are, of course, directly in line for commissions.

The company, battalion, or regiment leaves for France. There, before even taking up the training behind the lines, another reorganization occurs. More officers are needed for special work, and these are drawn from the new units. Then, after weeks of intensive drilling, the unit goes to the front-line trenches. Here two forces operate which tend to make many men commissioned officers. These are, first, the casualty list, and second, the enormous chances a man has to "get the goods" if he has developed the qualifications.

The officer, on the average, runs slightly less risk of being killed, wounded, or captured than does the private soldier, yet every week thousands of officers in the allied armies drop from their company rolls. Their places are taken by men who have risen from the ranks. The way this is done usually is that a man is recommended for a commission by his captain, major, or colonel. A few days later he is told that he may apply for a second lieutenancy, which he does immediately in most cases. His application is acted upon by the general staff. Often he is sent for a two-week period to some camp where additional training is given to would-be officers. On some occasions he is given his shoulder straps without further ado, and he is transferred to the point where he is needed.

The way that war rewards capability, once a commission is attained, is shown by the case of Col. Arthur Cleasby Waters, formerly a private in the famous London Regiment. His lieutenancy was won through sheer merit—mainly being secured because

"As the blank map began to assume recognizable shape, one of the officers in the background asked a question in French. The map maker answered without looking up."

as a sergeant he won the confidence of the men in his company by saving their lives at the disastrous engagement of Portrion Wood. This was the first engagement in which the British met the Germans' chlorine-gas attack. All along the line gasping, choking men, reeling and staggering away from the horrible greenish cloud which rolled down upon them in their shallow ditches, gave up parts of the line to the advancing Teutons. Sergeant Waters, in the midst of a frantic, smothering, gagging crowd of his own men, tried a desperate, nasty expedient — one which cannot be mentioned in print. After it was over even he was at a loss to account for his idea, but at any rate it worked. He found a way in which human beings could live through a cloud of chlorine!

Stumbling back and forth among his dying men, he told of his discovery. It was tried, and news of it sped like lightning down the broken line. The London Regiment, broken into scattered parts, deployed again and held the line against the Hun, who afraid of his own weapon, was advancing slowly and cautiously.

Gas masks came almost immediately after this, but Waters' exploit earned him his commission and the Victoria Cross. When his command was taken to Flanders he distinguished himself on three occasions, twice for rescuing wounded comrades, and the last time for bravery and sagacity in the successful taking of Thirty Trees Redoubt.

Often at a draft camp, qualities or accomplishments will be discovered in a man which he did not even suspect were valuable, and these lift him to a commission immediately. One striking example of this was a Cleveland youth who went with the first draft. A week after he arrived he happened to mention to the first sergeant of his company the fact that he was most familiar with all the country in the re-

gion of Verdun, having spent four years in this part of France. The sergeant told his captain, and the latter immediately summoned the young man. After careful interview, in which the youth told all about his life abroad, the captain dismissed him. Seemingly the officer had merely been curious.

A few days later a summons came from Washington, demanding the presence of the private immediately in Washington. This came from a certain high official, and of course the boy was given furlough to obey. Upon his arrival at Washington he reported, and was sent into an inner room to wait. A half hour later he was called, and in the assemblage into which he was projected he recognized many faces of men often pictured in the papers.

"You have said that you have driven your own automobile around the Paris-to-Verdun region for four years; that you know every foot of the roads; and that you speak four languages fluently, besides English. Are these things true?" The spokesman looked seriously but kindly at the young man.

"Yes, sir!"

At this a huge blank sheet of paper and a crayon were produced. The spokesman indicated a chair before the desk on which the paper was spread. "Now indicate roughly," he said, "the position of Verdun and all towns within a 25-mile radius, and show the main roads leading from one to another."

The young man sat down immediately and set to work. As the blank map began to assume recognizable shape, one of the officers in the background asked a question in French. The map maker answered without looking up. Then came queries in German, Scandinavian, and Dutch, which were all answered quickly.

As the drawing went steadily on the officers crowded closer and closer to the map. When at last the crayon stopped, the spokesman led the young man into the waiting room. Fifteen minutes later he was called back.

"You are to be transferred immediately," he was told. "You will report to General Pershing!" The young man did so, and was given a commission on the private staff of the general.

"During some of the fiercest fighting in the Ypres sector, his machine gun, almost alone, broke up a massed German attack that had nearly succeeded."

The British-Canadian recruiting mission in the United States is a good example of the success private soldiers in war time have in rising to commissions—and sometimes high ones. The personnel is more than half officers of this type, which, of course, is the best type there is, for men who have won their way through merit are invariably superior in ability and capability to those who have had the honor given to them through influence. Connected with the stations in the middle West alone are Major Keown, Captain Simmi, Capt. A. G. Owen, Lieutenant Masson, and Lieut. W. G. Hamilton, besides a half dozen others who are too modest to allow their names to appear in print.

Lieutenant Hamilton's case is well worthy of comment, for during some of the fiercest fighting in the Ypres sector his machine gun, almost alone, broke up a massed German attack that had nearly succeeded. For this he was recommended for a commission.

Across the water now our boys are defending a sector of the line. They are winning their commissions from the ranks. It is too soon yet for the stories, but it may be taken for granted that hundreds—yes, thousands, perhaps—of them will win their way to high place before peace is declared.

And then? That is the natural question. Of what use is it to climb to a major's or a colonel's commission if the end of the war will put the man back where he was at the beginning?

This takes a fallacy for granted. No man who has commanded a regiment, a battalion, a company, or even a squad, of other men in war can remain an underling when he gets back to civil life! Big business always is on the sharp lookout for ten, twenty, and fifty-thousand-dollar men who can demand and secure strict obedience, for executive positions.

TICKET OFFICE HAS NOVEL TELEPHONE INSTALLATION

Marked increase in efficiency has accrued through the installation in the Pullman reservation bureau of the Southern Pacific Railway's San Francisco office of special facilities for expediting telephone transactions. Three box-shaped, two-faced, 20-line switchboards are mounted along the middle of a 6 by 12-ft. table which accommodates a half dozen telephone clerks. Between these, within easy reach, are two multiple-section filing cases, the separate units of which revolve independently and hold in each of their four compartments the Pullman charts of a specific train for 16 consecutive days. The flexibility of this equipment makes it valuable. Six men during busy hours can handle incoming calls and make reservations without interfering with each other, while, at other times, one man, or as many as may be needed, can attend to matters from their respective chairs with equal facility.

The Switchboards are Wired So That Incoming Calls may be Answered by One or All of the Six Telephone Clerks

Looking into the Gaping Hole Torn in Pavement and Sidewalk by the Powerful Geyser. Right: The Break in the Main Is Plainly Visible. Corrosion and Electrolysis Caused the Accident

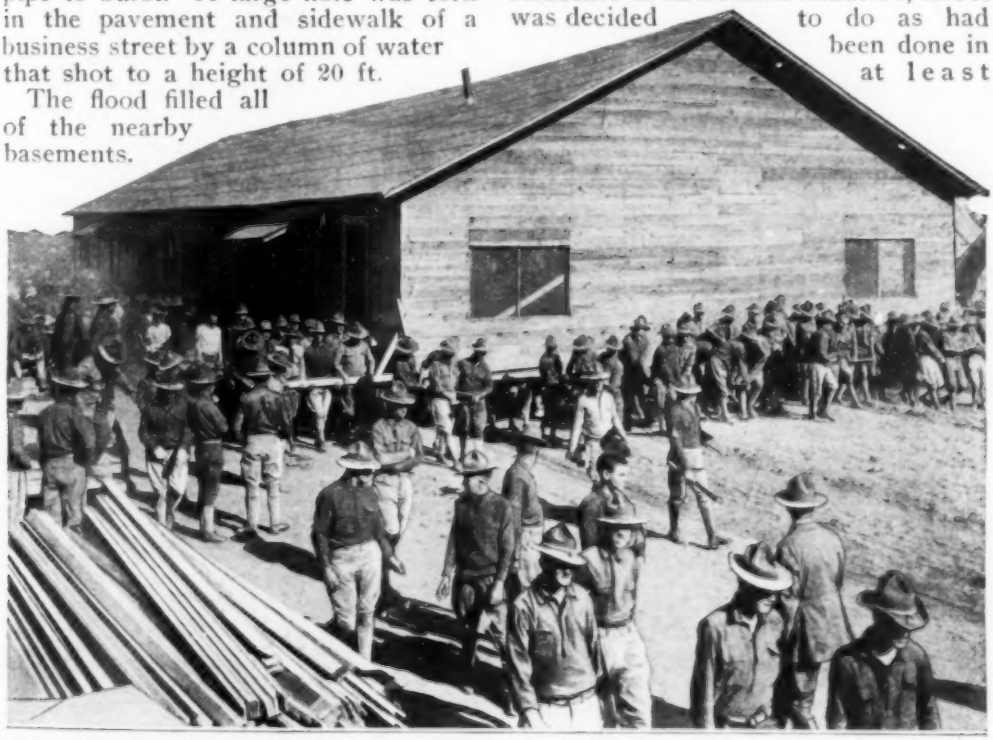
BUSINESS STREETS FLOODED WHEN WATER MAIN BURSTS

Cincinnatians were given an example some weeks ago of what corrosion, electrolysis, and time are able to do to underground utility mains. These at least were the elements that caused a high-pressure, 36-in. trunk-line water pipe to burst. A large hole was torn in the pavement and sidewalk of a business street by a column of water that shot to a height of 20 ft.

The flood filled all of the nearby basements.

SOLDIERS GLADLY CARRY Y. M. C. A. BUILDING

A practical demonstration of the Y. M. C. A.'s popularity with our army occurred recently at Camp McArthur, Tex., when heavy rains caused many men to move their tents to higher ground. This left the Y. M. C. A. structure in an isolated situation, and it was decided to do as had been done in at least

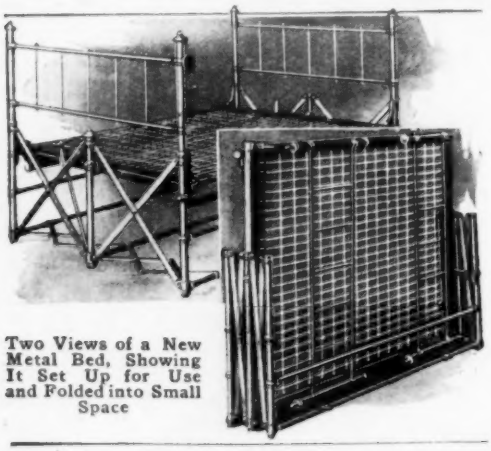


Several Hundred Soldiers Carrying the Y. M. C. A. Building at Camp McArthur, Texas, to a New Site on Higher Ground: The Floor was Removed to Permit Helpers Both Sides of Each Wall

one other camp, namely, let several hundred men carry it to the new site. The men ranged themselves along the walls outside and in—the floor having been removed—and all lifting together on cross beams that had been provided.

METAL BED COLLAPSES INTO SMALL SPACE

Lazy-tong braces, at its ends and underneath connecting its sides, are features of a new collapsible bed that



Two Views of a New Metal Bed, Showing It Set Up for Use and Folded into Small Space

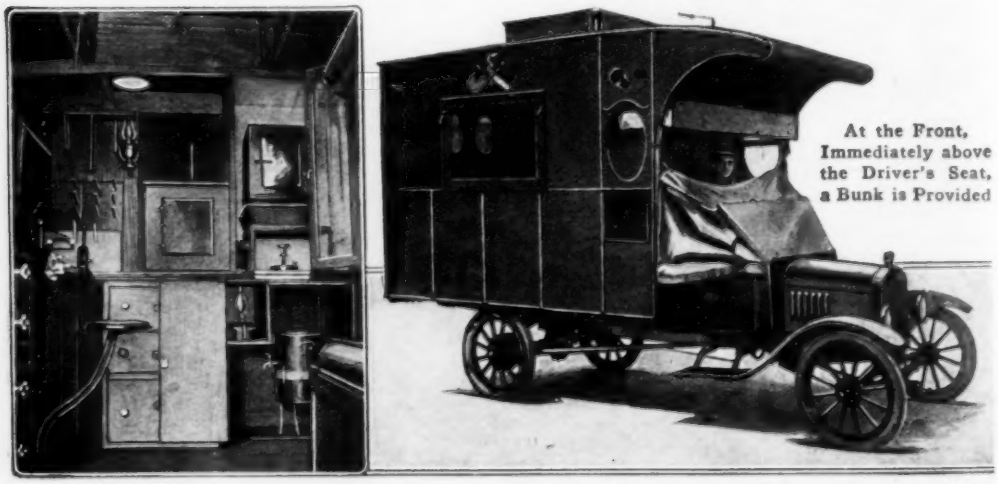
folds up compactly. The upper halves of the ends are hinged to the springs, which in turn are pivoted so that they are swung into a vertical position when the sides are brought together.

SCARIFIER REMOVES ICE FROM CAR TRACKS

When a sleet storm threatened to tie up street-car traffic in an eastern city recently, the situation was saved by using a scarifier. This many-toothed implement, built for breaking up old macadam, when attached to an old car and drawn over the tracks, effectively removed the glaze of ice, and made it possible to continue the car service. Fully 100 men would have been required to do the same work with hand tools, it is said.

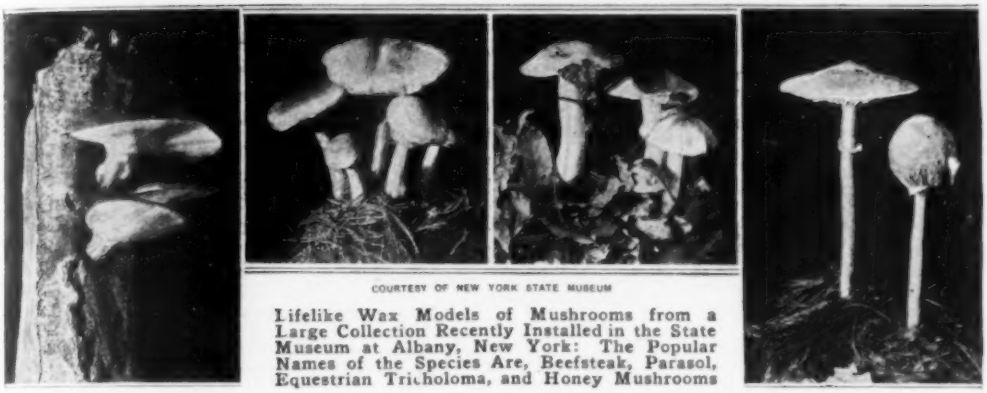
MOTOR CAR IS OUTFITTED AS FIELD LABORATORY

For the use of the medical staff of the Serbian army, a mobile bacteriological laboratory has lately been outfitted in this country. Funds have also been raised for its support at the front. Cholera, typhus, and blood poisoning have done more than Austrian bullets to thin the ranks of King Peter's forces, and it is to reduce the mortality due to such causes that the motor-car laboratory has been financed and constructed. It will follow the army and provide facilities for the analysis of drinking water, the sterilization of surgical instruments and dressings, and similar work. The laboratory is



At the Front, Immediately above the Driver's Seat, a Bunk is Provided

Left: Interior View Showing Compact and Convenient Arrangement of the Laboratory. It will Follow the Serbian Army in the Field



COURTESY OF NEW YORK STATE MUSEUM

Lifelike Wax Models of Mushrooms from a Large Collection Recently Installed in the State Museum at Albany, New York: The Popular Names of the Species Are, Beefsteak, Parasol, Equestrian Tricholoma, and Honey Mushrooms

7½ ft. long, 6½ ft. high, and 6 ft. wide. In front, immediately above the driver's seat, a bunk is provided in a well-protected place.

ALASKA SOIL FROZEN DEEP AGES AGO, IS THEORY

Miners and geologists familiar with conditions in Alaska are aware that in many places the ground in that country is permanently frozen, except on the surface, to a depth of 200 and even 300 ft. While this has been popularly attributed to long-continued low temperatures in winter, the interesting theory has recently been advanced by a scientist that the condition is due to far colder weather that obtained in some previous age, and that protective vegetation on the surface has kept the frost in the ground permanently since then. It has been found that when moss has been cleared away for open-cut mining or farming, the upper level of the ground frost seemed gradually to descend. If such is the case, it may show that present temperatures are not low enough to freeze the ground to the great depths cited above.

REMARKABLE COLLECTION OF MUSHROOM MODELS

A remarkable collection of 57 models of mushrooms has recently been installed in the State Museum at Albany, N. Y., representing 45 species of edible and poisonous plants. Made of wax from casts made in the field, each is pronounced a truly exquisite work, the form, coloring, and natural surroundings being reproduced with the greatest care. The exhibit is of much popular interest because it enables one to study the differences between the edible and poisonous mushrooms. At the same time it is of decided scientific value because it includes such a variety of species and is accurate in every detail. The collection is a memorial to the late state botanist of New York who, during 47 years of public service, became an acknowledged authority on the subject of fungi.

HYDRAULIC TIRE PUMP WORKS WITHOUT OIL

A new air compressor for inflating tires is not open to the objection that it will harm the rubber by injecting more or less vaporized oil into the tubes, for no oil is used in the device. The piston operates automatically, its delivery depending on water pressure, until a desired air pressure is obtained.

¶ The breaking of an aeroplane wing did not keep two officers from completing a recent flight in the Southwest, due to the fact that one daringly left his seat and held the wing until they landed.

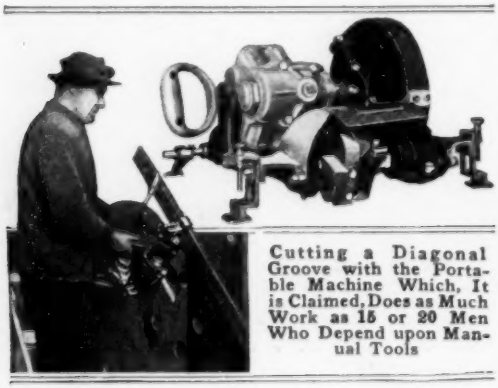
MECHANICS IN CARTOON

THE AIRY-PLANE BUG

"Say, Mister, will ye please take Robert fer jest a short ride? He's got th' airy-plane bug bad."

GROOVING MACHINE IS USED IN BUILDING WOOD SHIPS

Revival of the wooden-shipbuilding industry has brought into the limelight a number of labor-saving appliances, among which is a grooving and planing machine, capable, it is claimed, of doing as much work as 15 or 20 men equipped with manual tools. The device weighs about 56 lb. and may be driven either by compressed air or electricity. The cutting head consists of a series of saw and knife members. The former are mortised in the opposite sides of rotating segments, and in operation are followed by the knives which remove the wood between the saw lines.



Cutting a Diagonal Groove with the Portable Machine Which, It is Claimed, Does as Much Work as 15 or 20 Men Who Depend upon Manual Tools

PREVENTION OF ACCIDENTS IN THE HOME EXPLAINED

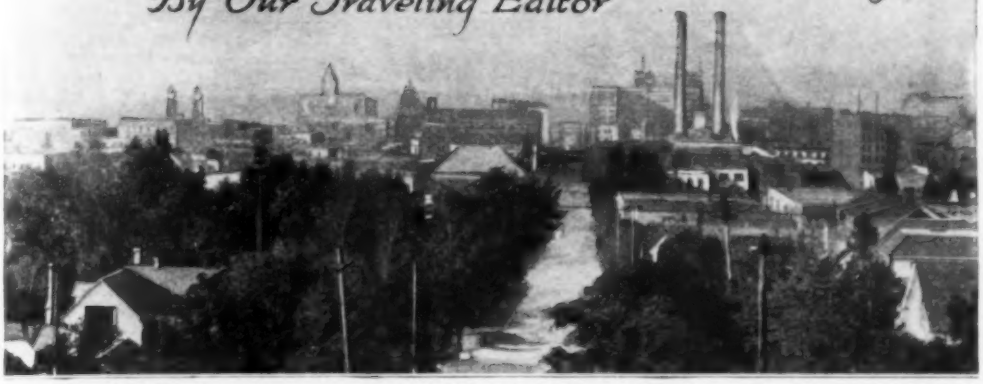
Because the number of accidents, fatal and otherwise, in modern American homes, equipped with electric appliances, gas, plumbing, etc., is far greater than need be, the Bureau of Standards has prepared an illustrated booklet entitled "Safety for the Household." All of the common hazards that exist in the home are explained here, and just what to do in case of accident. The text and photographs make it plain, for example, why one may be in danger of instant death if he turns on an electric light with one hand while opening or closing a water faucet with the other. Scores of other fire and accident hazards due to the use of electricity, gas, and fluid fuels, are carefully discussed. The use of lightning rods, especially for barns, is strongly commended; good and bad types of flexible gas hose are pictured, and how to use a fire extinguisher is explained. The publication may be obtained by sending 15 cents to the Superintendent of Documents, Government Printing Office, Washington.

FISHERIES BUREAU URGES EATING OF EULACHON

As a part of the government's program for inducing the country to draw on food supplies heretofore but little known, the Bureau of Fisheries has begun a campaign to popularize the eulachon. It is described as one of the finest fish in the world—tender, delicate, and easily digested. The species is also known as the candlefish.

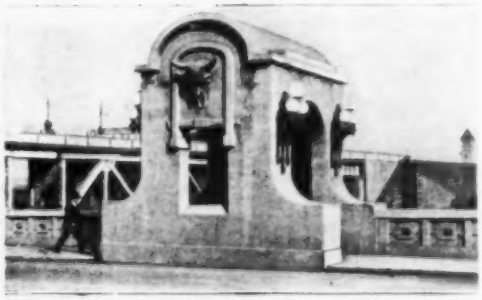
Intimate Glimpses of Spokane, Washington

By Our Traveling Editor



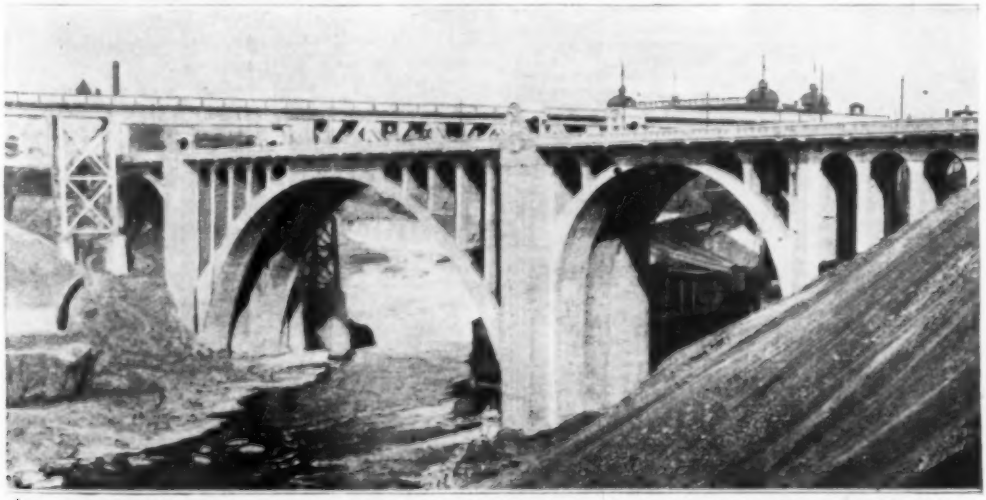
The Hills to the South of the City are Studded with Palatial Homes Which Overlook the Business District

ENTERING Spokane by rail from the east or west the eye of the first-time tourist cannot fail to be captivated by the sight of a beautiful river, along the shore of which the railroads run for several miles before arriving at the terminal. It is a roaring torrent of greenish-white water that foams and swirls over bowlders and miniature cataracts before imitating Niagara with a final plunge of some 130 feet. This is the Spokane River, so named because a band of Indians who called themselves "Spokane," or "Children of the Sun," as it meant in their language, found excellent fishing just below the falls long before the first white men came to the country.



Artistic Rest Houses of Concrete Mark the Four Corners of the Great Arch of the Spokane Bridge

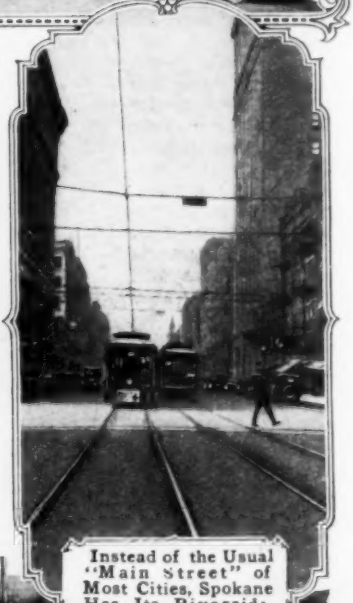
It is this river that is directly responsible for Spokane in the form of the splendid city that it is today. The white men drove the Indians away and built a little settlement that they called Spokane Falls. But its growth was so rapid that as it spread to both banks of the



Numerous Bridges, Massive Structures of Concrete and Steel, Connect the Halves of the City on Either Side of the River. This Is the Spokane Bridge. It Spans the River Just below the Falls

Post Street, Looking North from First Avenue, Has an Air of Hustle That Characterizes the City as One of Commercial Importance

A View of the Upper Falls, Which have been Practically Drained by the Numerous Penstocks Developing Waterpower



Instead of the Usual "Main Street" of Most Cities, Spokane Has Its Riverside Avenue

Much Available Waterpower in the Spokane River is Still Undeveloped. There Are Numerous Places Like This That will be Harnessed as the Demands Increase

There Are Numerous Fashionable Clubs in the City. One of the Foremost among Them Is the Spokane Club

The Spokane County Courthouse Is an Oriental-Looking Structure

Economy of Construction has been Effected in the Construction of Many of the Inter-City Concrete Bridges by the Use of Molded Sections

In Municipal Beauty Spokane Has Many Novel Features. This Building, Which Has the Appearance of a Palatial Residence, Is the Down-Town Office of an Insurance Company

river, the falls became a minor institution, and were eliminated from the community name. It is now a great industrial center, a city of fine wide streets, massive buildings, and beautiful homes. It is spotlessly clean, and with an atmosphere crisp and fresh from the mountains. Even in the down-town streets the air is usually tinged with a slight aroma of the pine woods. Obviously this condition is due to the fact that electricity is the universal motive power, and to the mildness of the climate that enables the heating of an entire household even in the coldest winter weather with a few slabs of wood for fuel. The energy of the great waterfall has been harnessed in the form of hydroelectric power to turn the wheels of commerce. This power is carried over enormous transmission lines and brings the lead, gold, and silver out of the mines in the surrounding mountains. Many of the mines, as far away as those of the great bonanza lead district in the Coeur d'Alene Mountains of Idaho, are operated with Spokane electric current.

In its climate Spokane has an asset of inestimable value. The winters are comparatively mild, and extremes of heat during the summer are wholly unknown. Climate has aided industry which, with abundant resources and readily available water power, has given the city an industrial development which, in rapidity and permanence, is said to be second to that of no other city in the United States.

The vast areas of standing timber, together with the water power, has evolved the lumber business into one of great importance. Following the lumber industry during recent years have come numerous plants for the manufacture of furniture and other goods, the intensive development of the mines, and the opening to agriculture of the surrounding lands denuded by the lumbering operations.

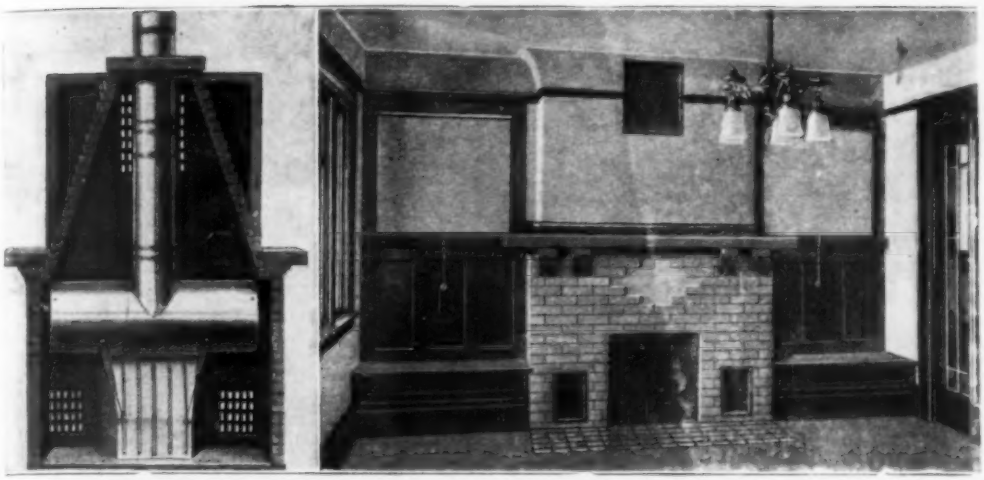
This favorable combination has created a most ideal social and economic condition, as well as an exceptionally high standard of living among all classes of people. Schools, churches, theaters, and other beneficial institutions have flourished, while saloons and kindred vices went down the toboggan with state prohibition. Although originally tinged with all the earmarks that have characterized other western cities during the wild and woolly early days of their careers, Spokane is now a peaceful, law-abiding city, with a negligible amount of crime, and an enviably low death rate.

Spokane is frequently alluded to as the "City of Miners," because it is the home of many men and the families of men who have amassed great wealth in the development of the mineral resources of the vicinity. Many whose mining interests are as far away as the lead districts of Idaho, and even the copper and gold regions of Montana, make their homes in the city, that their wives and children may have the advantage of the social and educational facilities that it offers them. To this class of wealthy citizens may be attributed the numerous palatial residences that line the magnificent wooded boulevards in the suburbs of the city, and the numerous recreation places that are usually pointed out to the tourist with just pride. There are several splendid public parks both within the city limits and near by, while the lake region, only a few minutes' ride from town by trolley, or over excellent motor roads, is the scene of all manner of aquatic sports. The surrounding hills are full of game, and the many streams are all fishermen's delights. Golf is one of the most popular forms of recreation. It holds much the same public interest that baseball does in other parts of the nation.

With the possible exception of the southern Californian, it is doubtful if there is to be found anywhere in the United States people who are more loyal boosters of their local territory than are the residents of Spokane. And the tourist who has an ear for reason, after weighing the assets of the city and those of the surrounding territory, must agree that it is really a delightful place to live in. Then, after applying the American acid test of a community by an investigation of its business possibilities, it becomes evident that the Spokane Falls of yesterday and the Spokane of today are but the harbingers of a greater Spokane tomorrow.

NEW FIREPLACE GIVES HEAT AS WELL AS CHEER

Heating efficiency is the outstanding attribute claimed for a fireplace embodying new ideas of construction. To attain it, the cheerfulness of the open fire is not sacrificed. A heavy cast-iron firepot, above which is a horizontal sheet-steel drum fitted with baffles that may be adjusted to produce a direct or indirect draft, is used. Before passing into the flue the hot gases are diverted to the outer ends of the drum by the indirect-draft arrangement, which is employed except when starting a fire. The pot, drum, and metal flue have wide air spaces separating them from the brickwork which incloses the unit. Cold air is drawn from the floor through gratings. In circulating around the firepot and drum, it becomes highly heated and



Left: Fireplace as Seen from the Rear, Showing Arrangement of Firepot, Drum, and Flue. Right: Cold Air from the Floor Passes through the Gratings at the Bottom, is Heated by Contact with the Firepot, Drum, and Metal Flue, and Returned to the Room through the Register near the Ceiling

passes back into the room through a register provided near the ceiling. The fireplace seems to have given satisfaction where installed in the Northwest.

ENGINE MOUNTED LATERALLY ON NEW FARM TRACTOR

One of the features of a new kerosene-burning farm tractor is the manner in which the motor is mounted. Instead of being set in the conventional way, it is placed crosswise of the frame. The purpose of this is to provide a direct, straight-line drive that simplifies the transmission of power to the bull wheels and eliminates the use of bevel gears. Because of the arrangement of the engine, the radiator is fixed longitudinally instead of crosswise. This, of course, does not effect its efficiency, because a slow-going tractor, unlike a motor car, depends almost entirely upon the fan to provide the necessary inrush of air.

¶A new balloon fabric has been developed which is made of interwoven bands composed of parallel rubberized threads of cotton, silk, or linen.

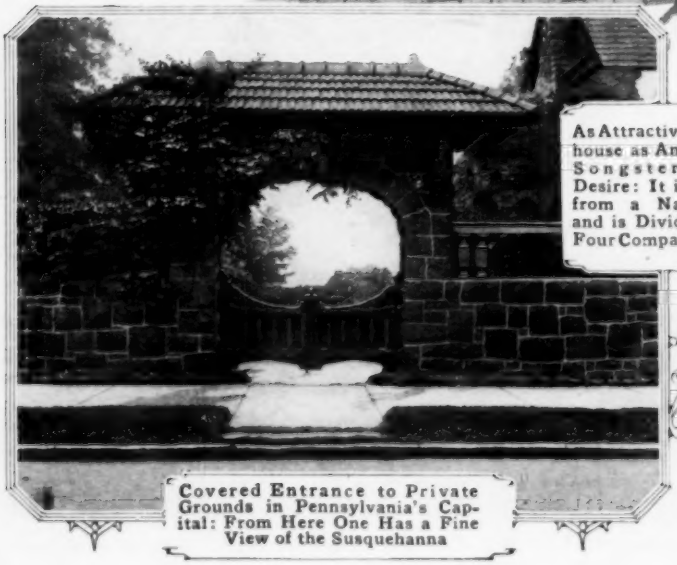
Direct, Straight-Line Drive is Attained by Mounting the Motor across the Frame, in Contravention of Standard Automobile Practice

A VARIETY OF ATTRACTIVE OUTDOOR FEATURES

For the Sake of Stability the Base of This Flagpole and Its Supports are Built into the Stone-work

Massive Lawn Seat of Concrete: Ornamental Panels of Green Tile are Set in the Back

A Charming Front Gate, Having a Japanese Aspect, in a Wall of Clinker Brick and Stone, Purposely Made Irregular

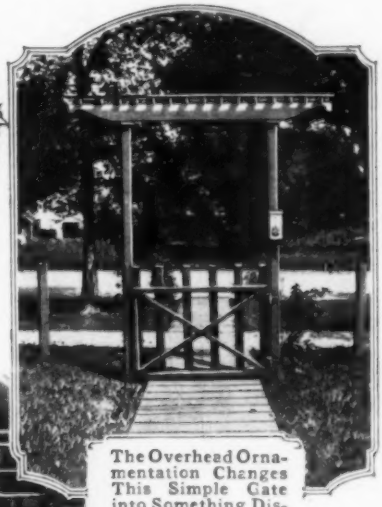


Covered Entrance to Private Grounds in Pennsylvania's Capital: From Here One Has a Fine View of the Susquehanna

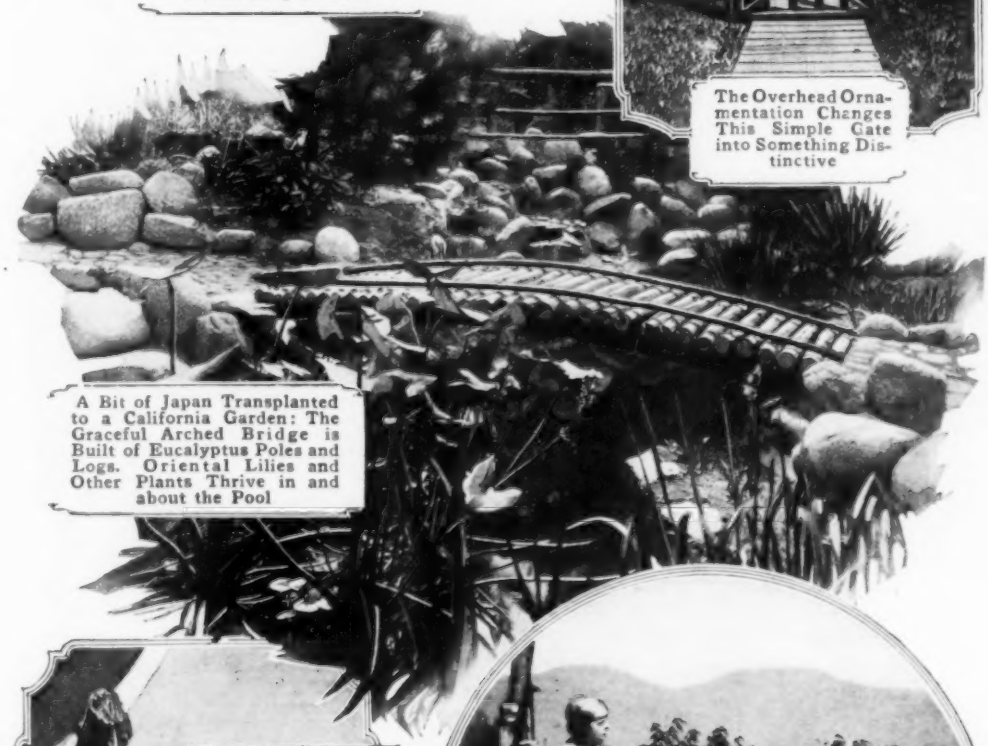
As Attractive a Bird-house as Any Little Songster could Desire: It is Made from a Nail Keg and is Divided into Four Compartments

SUGGESTING NEW WAYS TO BEAUTIFY THE YARD

Two Pines Standing Close Together Made This Rustic Bench Easy to Build



The Overhead Ornamentation Changes This Simple Gate into Something Distinctive



A Bit of Japan Transplanted to a California Garden: The Graceful Arched Bridge is Built of Eucalyptus Poles and Logs. Oriental Lilies and Other Plants Thrive in and about the Pool

A Rustic Bird Bath De Luxe: The Hollowed Log Is Cement-Lined and Water Flows through a Pipe in the Stump

Being S-Shaped, This Stone Seat High in the Catskills Permits One to Sit Facing the Landscape in Any Direction

NEW YORK STATE BARGE CANAL RIVALS PANAMA FEAT

By STANLEY W. TODD

PART II—FEATURES OF THE CANAL

A NUMBER of unusual structures have been utilized in constructing the New York State Barge Canal as a protection against floods and ice jams during the spring, the open season of the canal being from May to November. The most important of these are the massive movable dams which span the canalized Mohawk River. These present the appearance of steel bridges, but from the downstream side of each hang heavy steel frames which rest against a concrete sill extending across the bed of the stream. Placed upon these frames, in tiers of two and three, are heavy steel gates, which can be raised or lowered at will by means of an electric winch that runs on the bridge floor of the dam. By raising these gates, the depth of the water in the channel may be controlled. In the event of a heavy flood, all the gates can be raised, thus offering no resistance to the rushing waters or ice floes, and protecting the different locks and surrounding country from damage by inundation.

A Great Lakes Schooner Destined for War Service Making a Short Cut to the Atlantic via the Canal: It was Dismantled So That It could Pass beneath the Bridges

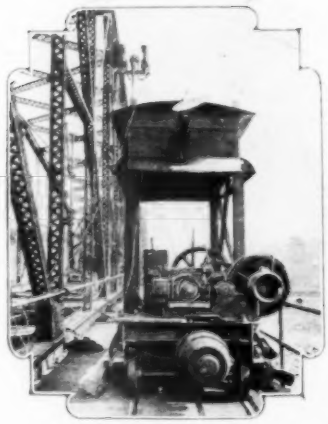
Dams of the fixed type are also employed. The largest are located at the little towns of Crescent and Vischer's Ferry on the Erie Canal, and at Seneca Falls on the Cayuga-Seneca branch canal. The most interesting variations of the fixed dam are those equipped with what are known as "Taintor" or sector gates. These comprise huge circular partitions heavily weighted in the back. They can be moved so that the crests of those particular sections of the dam can be lowered, and by means of the regulating notches of the gates, be opened up or shut off for the discharge or storing of water, as conditions demand.

In order to provide sufficient water all the time for the movement of boats in the eastern section of the Erie Canal, an adequate water supply has been provided in the form of two big storage reservoirs. These are known as the Delta and Hinckley dams. The first is a concrete structure 1,100 ft. in length and provides for the storage of 2,750,000,000 cu. ft. of water. The Hinckley dam is mainly an earthen structure and is 3,700 ft. long, and provides for the storage of 3,455,000,000 cu. ft. of water. In both cases the dams have created an artificial lake, which extends over an area of almost five square miles. The Delta dam, particularly, is a massive work, holding back as it does the Mohawk River. A short distance from its base the relocated Black River Canal crosses on an aqueduct and then ascends the steep river bank by a flight of three locks.

In addition to the various dams and locks on the canal system, there are about 400 structures. Two particularly interesting types are the guard gates and the siphon spillways, while dozens

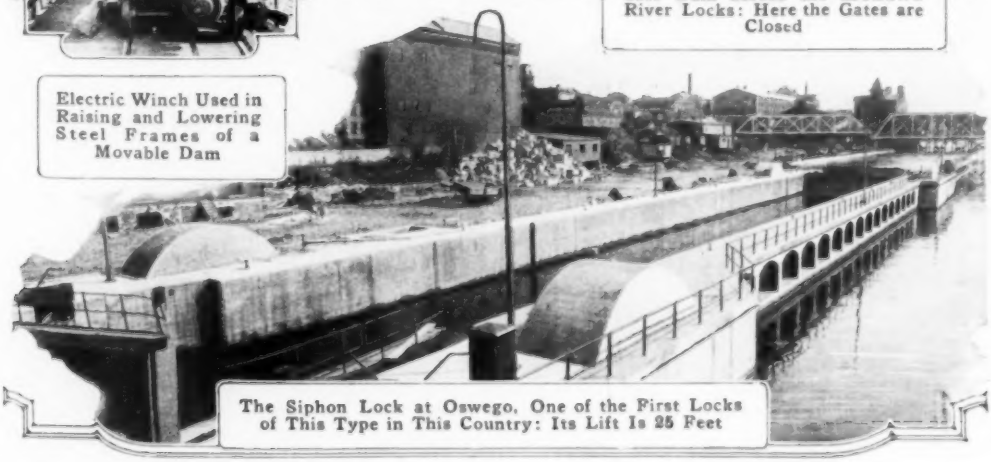
Tainter Gates: These Constitute One of the Means by Which the Depth of the Water in the Canal is Governed

Winter View of a Movable Dam with the Heavy Steel Frames Raised to Let the Ice Pass



Downstream View of the Movable Dam across the Mohawk River Locks: Here the Gates are Closed

Electric Winch Used in Raising and Lowering Steel Frames of a Movable Dam



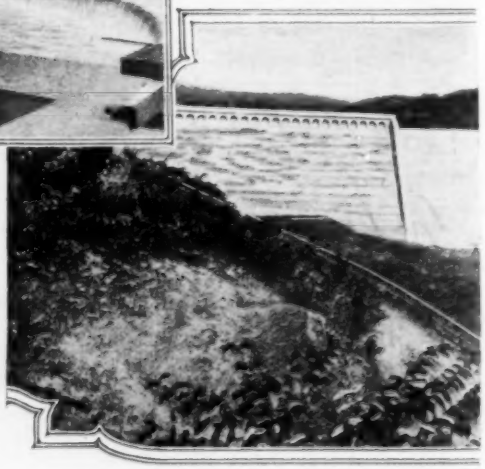
The Siphon Lock at Oswego, One of the First Locks of This Type in This Country: Its Lift Is 25 Feet

of railway and highway bridges, all original in appearance, cross the canals at different points. The guard gates are reinforced-steel obstructions, which can be let down on the towers which support them, so as to shut off all the water. They are located 10 miles apart in the "land line," and at points where the canalized rivers and lakes connect with the artificial channel. In an emergency the guard gates may be shut, cutting off all the water in the channel and permitting the repair of its banks, and guarding against damage by flood to the other structures and surrounding territory. The spillways serve to further guard against a break in the banks, as they permit the escape of water when it reaches a certain level. The siphon spillway is of great advantage and is used in restricted communities where the old-fashioned overflow type of spillway would take up too much space.

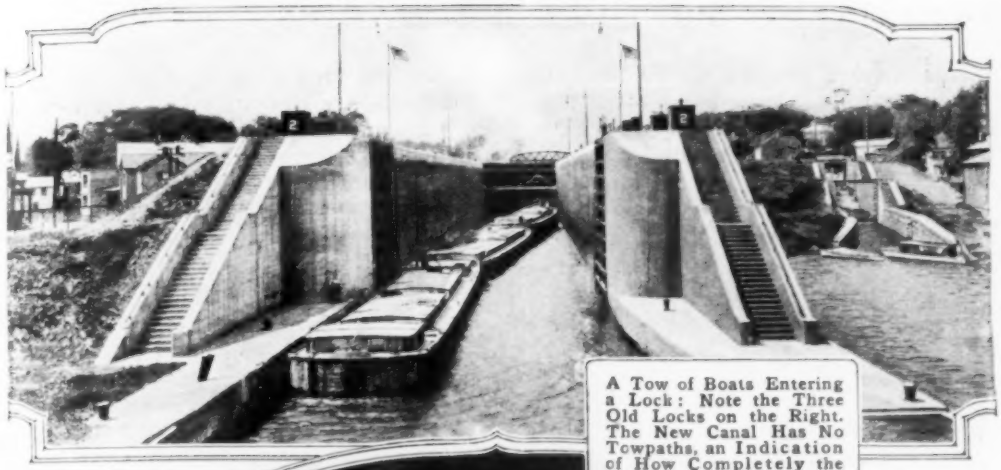
There are no towpaths on the new canal. The big barges that are to go through it must be run by mechanical means. One barge may tow two or three others, but the horse or the donkey has gone forever, as far as the state barge canal is concerned. Just what type or size of barge will be most practical on this great waterway has not been decided as yet. A number being considered for use have various dimensions. Eight self-propelled boats, 150 ft. long and 22 ft. wide, with a capacity of 600 tons, are being built by one company. These are of steel and wood and will be driven by oil engines. Another type of the same general proportions will be operated in fleets of four, carrying 2,800 gross tons of ore at a trip. One company is designing a new coal barge to carry 2,160 tons of coal and to be drawn by a tug. The state engineers expect that eventually there will be a standard self-propelled boat that will be able to make trips on the Great Lakes and along the coast.

The possibilities of the new canal in war times have already been demonstrated. The demand for ships on the coast recently led the owner of a schooner on the Great Lakes to send his vessel through the canal to New York. It was necessary to dismantle the craft so that it could pass under the bridges, but it made the trip in less than half the time it would have taken to go down the St. Lawrence and along the Atlantic coast. On another occasion a number of submarine chasers, each 110 ft. long, were sent through the canal, as well as government mine sweepers and naval launches. The enlargement of the old canals was the only thing that made this possible, as the former dimensions would not have permitted the passage of a 110-ft. boat through the locks. The output of many of the shipyards on the Great Lakes has been sent to salt water via the barge canal.

The state officials

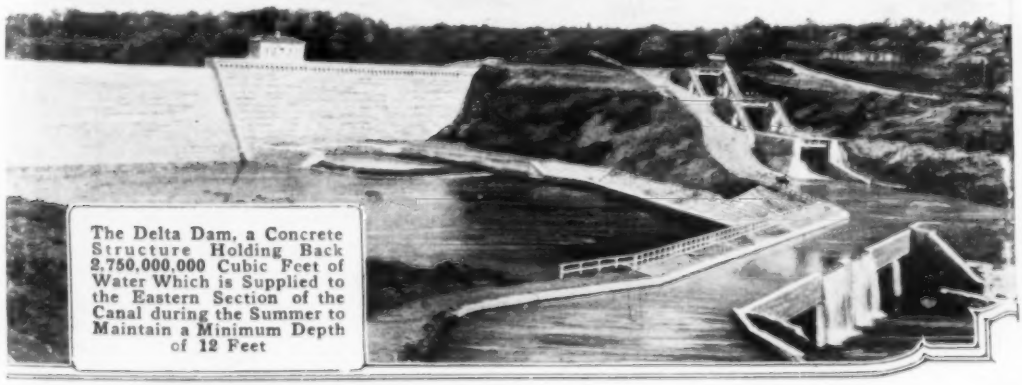


The Beautiful Waterfall Formed by the Crescent Dam: This Is One of the Largest of the Barriers of the Fixed Type Located on the Canal



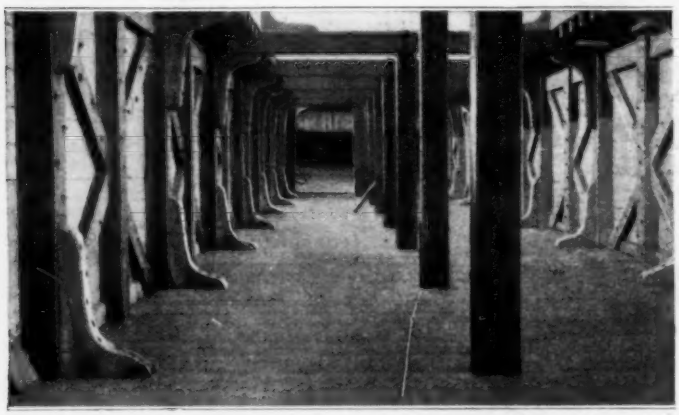
A Tow of Boats Entering a Lock: Note the Three Old Locks on the Right. The New Canal Has No Towpaths, an Indication of How Completely the Once Familiar Mules and Horses have been Supplanted by Engines

Locks at Waterford Illuminated by Powerful Arc Lamps: One of Many Beautiful Night Scenes That may be Viewed along This Waterway Which Passes through Scores of Busy Towns and Cities. The Canal Is Open from May to November



The Delta Dam, a Concrete Structure Holding Back 2,750,000,000 Cubic Feet of Water Which is Supplied to the Eastern Section of the Canal during the Summer to Maintain a Minimum Depth of 12 Feet

under whom much of the finishing work has come, have been attempting to induce the Federal Shipping Board to appropriate a certain sum for the construction of barges for the state canal.



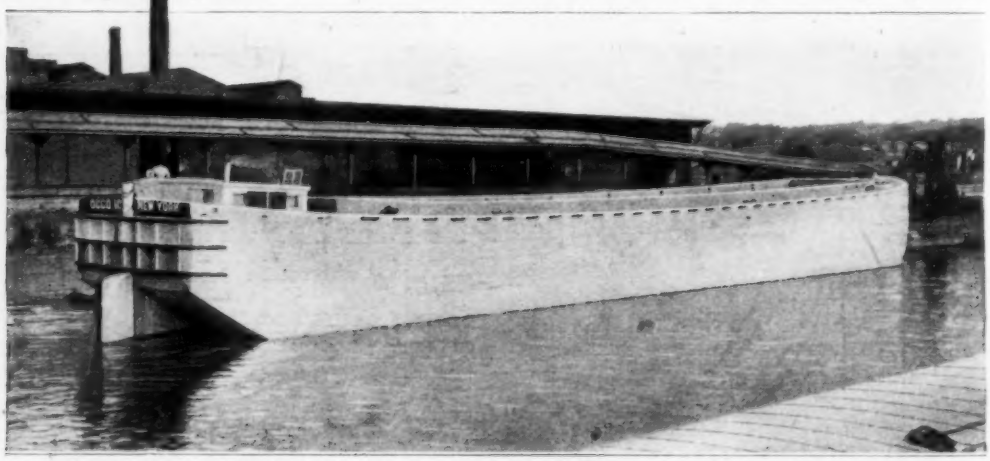
Interior View of the Barge Pictured Below, Showing How a Maximum of Cargo Space has been Provided for Carrying Iron Ore

They point out the immense war value of the canal in relieving freight congestion and for transporting ordnance and munitions of war from inland points. In this connection Governor Whitman recently stated that if the Federal government would avail itself to the limit of the great waterway, approximately 18,000 railroad cars per month could be released for other traffic, a saving of over 2,000,000,000 ton-miles. It is estimated that the normal capacity of the canal will be 10,000,000 tons of freight a year, and terminals are in course of construction at a number of important cities throughout the state which are served by the new canal system. Altogether three and a half miles of wharfage have been built, while eleven miles more will soon be available for future improvement and use. The chief concern of the state officials is to see that now that the canal system is perfected it will be used to the fullest extent.

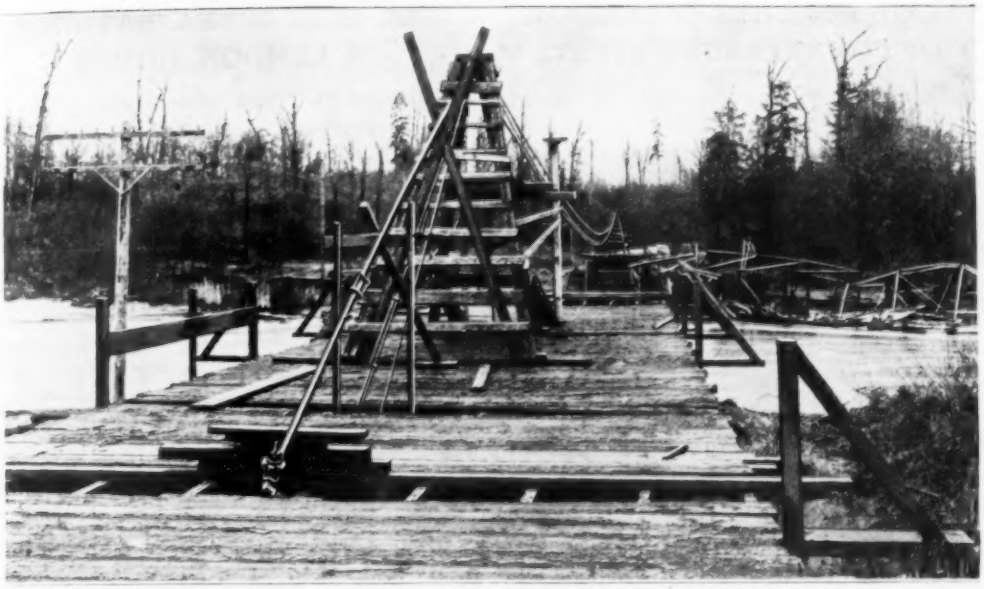
Discussing the coal problem the governor also declared that in order to utilize the new waterway for the transportation of coal all the 240-ton canal boats now in service would be required, and in addition about 400 new ones, of the same carrying capacity, must be built.

GAS-SUPPLY PIPE FOR CITY SUSPENDED ACROSS RIVER

When a bridge across the Nesqually River in Washington was swept away by high water some weeks ago the Tacoma Gas Company's pipe line, supplying the city of Olympia, was put out of service. The emergency was



A 1,000-Ton Barge Constructed by a Carrying Company for Transporting Iron Ore from Port Henry, New York, to New Jersey, via the Champlain Branch of the Barge Canal



The Towers Erected on the Approaches Are 325 Feet Apart and Support the Cable and Two-Inch Pipe

met by spanning the swollen stream with a steel-wire cable and suspending from it a 2-in. pipe. To carry this unusual overhead system, timber towers were erected 325 ft. apart on the opposite approaches. A new bridge is to be constructed at a point about 100 ft. upstream from the former one. This will not be completed before next fall, and in the interim the aerial gas line will remain in service.

CARS ON SLIPPERY ROADWAY IN ORGY OF ACCIDENTS

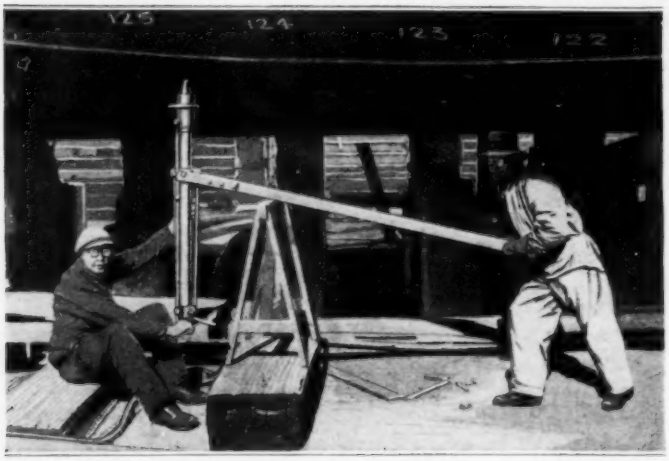
There is a short road at the head of a quarry at Avondale, Pa., which apparently should be avoided in wintertime by motorists who do not wish their beneficiaries to collect from insurance companies. To elucidate: Late in February a motor truck skidded, broke through a stone parapet, and balanced on the brink of a rocky precipice. One of its occupants, thinking the machine doomed, leaped. He fell 100 ft. to his death. The driver, who was restrained from jumping because of his position, escaped without a scratch. A few minutes later another car turned into the road, skidded, and struck a telegraph pole, killing its driver. A half hour elapsed before an undertaker's car from Chester, Pa., approached the fatal scene. It skidded.

One Man Leaped to His Death. The Other Couldn't, and Therefore Lives

The driver, who was thrown out, sustained a fracture of the knee.

TOOL PUNCHES OUT HEADS OF COUNTERSUNK RIVETS

For removing countersunk rivets from the sides and bottom of steel ships, or other structures, a pneumatic rivet-



Showing How the Pneumatic Tool is Held in Place When Removing Rivets from the Bottom of a Steel Vessel

cutting tool is being used which does the work in about a tenth of the time that is required when the heads are dug out. The head is punched through and the member removed by the powerful action of the instrument's "back-out bar." When they can be reached, the device is able to cut off and remove 7/8-in. rivets at the rate of one in 10 seconds. It is also well adapted for other work of a similar character.

WAR STOPS "SEA BATHING" IN LONDON HOMES

Humorists have recently added to the list of the war's alleged horrors the fact that Londoners can no longer bathe in sea water in their own homes. It seems that for years one of the English railways has maintained a "sea-water" service. For the small sum of 12 cents it has delivered to any customer a large can of real ocean water for bathing purposes, calling for the can the following day. Now, however, Londoners, who pride themselves on being "the best tubbed people in the world," must forego these "sea baths," for the railway has discontinued its service on account of war conditions. Henceforth fresh water must suffice for cleansings.

DUAL BUSINESS BUILDINGS OF UNCOMMERCIAL ASPECT

Quite an interesting instance of a group of dwellings that is not a group of dwellings at all—not even a "group"—is afforded at a new motion-picture plant in a California city. What appears to be six separate residence structures of different types of Eng-

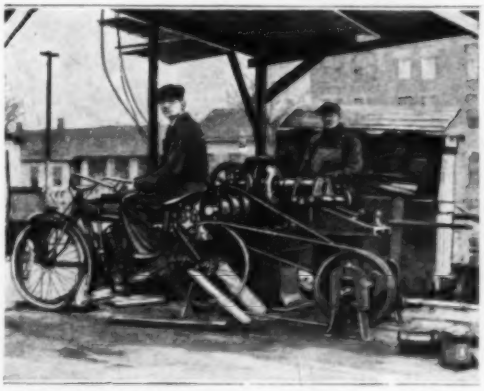
This "Row of Residences" Camouflages Two Buildings, One Used as the General Office and the Other as the Photographic Laboratory of a Moving-Picture Plant

This Picture Shows the Same Structure as the One Above, but was Taken from the Opposite End of the Street

lish architecture in reality constitutes the camouflaged exterior of two buildings, one occupied by the photographic laboratory and the other housing administrative offices of the concern.

PLUMBER'S LATHE DRIVEN BY A MOTORCYCLE

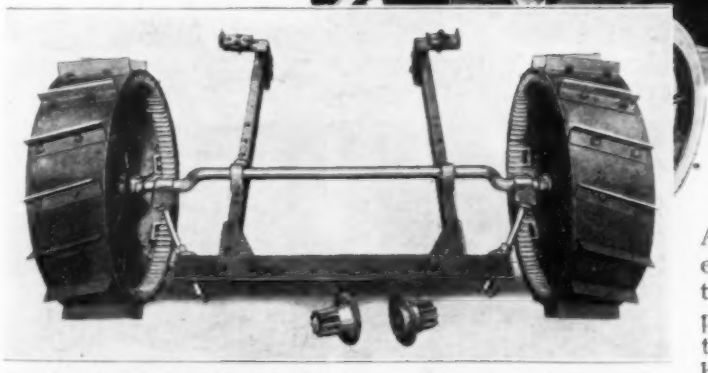
A motorcycle was put to a novel use not long ago by a plumber who employed it to drive a screw-cutting lathe. The motor which ordinarily furnished the power had been removed and the motorcycle, with its rear tire removed, was installed in its place, connection being made with a belt. One man seated on the vehicle controlled its speed. Extra braces were provided to hold the rear wheel steady.



Motorcycle, with Rear Tire Removed, Furnishing Power to Run a Plumber's Lathe

TRACTOR ATTACHMENT BUILT FOR FARMER'S AUTO

Of interest particularly to the small farmer is an appliance, lately developed, that enables any roadster or touring car to be employed conveniently as a tractor. The device may be attached or removed quickly and does not impair a machine's usefulness as a family vehicle at other times, or subject it to injurious strains. It provides a car owner capable equipment at low cost for field and road work.



The Attachment Fits Any Motor Car and Allows It to be Used as a Farm Tractor. The Driving Pinions, Shown at the Bottom, Replace the Rear Wheels of the Automobile and Mesh with the Bull Ring Gears

The rear wheels of a car are replaced by driving pinions that mesh with bull ring gears of big steel driving wheels when the side channels of the tractor frame are clamped to the chassis. The capacity of the outfit depends upon the type of car used. With a small, light machine a two-bottom plow is handled.

Showing the "Tractor" Installed on a Light Touring Car: A Gear Reduction of 11 to 1 Allows Heavy Work to be Done without Injurious Effect to the Machine

A larger and more powerful automobile is able to take a four-bottom plow. A gear reduction of 11 to 1 allows heavy work of this character to be done easily. An auxiliary cooling system and a device for preventing dust from entering the engine are provided.

ORGANIZED SNAKE HUNTING

By FRANK McLEES

A Pet Copperhead Which, if Handled Carefully by Its Owner, will Do No Harm

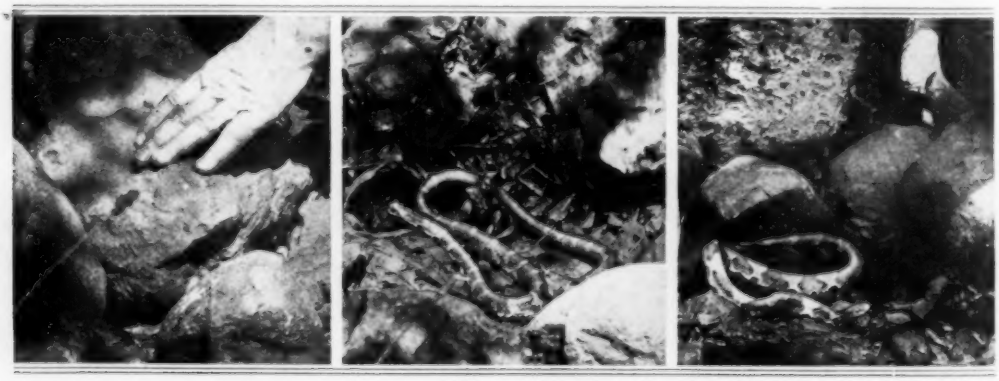
Garter Snake Enjoying a Sun Bath a Few Inches above the Water

THE sport of snake hunting is not new, but it is only within the past few years that the Boy Scouts, the Y. M. C. A., and others, have taken to hunting snakes in large parties, accompanied by one or more experienced hunters. The snakes are caught alive and after the hunt are either added to collections or released. They are never killed unless they happen to be copperheads or rattlers. North of Maryland the rattlesnake and the copperhead, both easily recognized, are the only dangerous serpents found in the wild state. All others may be handled safely. Large specimens can scratch the skin with their teeth, but the bite is not poisonous. A kid glove would be ample protection in case of attempted bite by a large blacksnake or water snake. But gloves are not necessary. The hunter is likely to be scratched far more severely by briers than by any nonpoisonous snake he may capture.

The equipment is simple and inexpensive. A long stocking with the foot cut off and the wide end sewed up to form a bag is all that is necessary.

Garter Snake Swallowing a Fish: Many Reptiles When Captured Are Hungry Enough to Eat Out of Hand

Several such game bags may be carried where it is desired to keep varieties separate. To be successful the



Finding the Quarry: The Views from Left to Right Show Stones beneath Which a Snake is Hidden, a Milk Snake That has Just been Uncovered, and a Startled Copperhead About to Strike

Proud of Their Wriggling Trophies: Boys from a New Jersey Y. M. C. A. and Their Leaders Displaying Small Boa, King, Water, Brown, Gopher, Pine, and Garter Snakes—All Harmless Species

hunter should know something of the game's habits. He should also know by sight the copperhead and the rattlesnake in order to avoid mistakes.

Snake hunting is very uncertain. One day the bag may be very heavy, another day, under apparently the same conditions, none at all may be found. There are many surprises. Usually the hunter is taken unawares to a greater degree than is the snake. The hunter moves unconcealed in the open while the snake is likely to be hidden and motionless. Snakes are not very intelligent, but they have a strong instinct for concealment. They cannot hear, as they have no ears, but they can feel the slightest vibration of the surface on which they may be lying. Thus the tread of the hunter may warn the snake of approaching danger, and it will quietly withdraw into a hiding place. If encountered in the open, it is seized with panic and makes a wild dash for cover. But when safely coiled under a stone or log, it appears to relax its keen vigilance, owing perhaps to instinctive trust in the cover's permanence, so that when the stone is suddenly lifted the snake lies still for a moment or two, apparently unable to realize that the stone could be moved. This gives the hunter time to make his capture. Beginners often ask, "How shall I catch him?" There is only one way to catch him if you want him, that is to seize him promptly before he collects his wits and dashes away.

The harmless snakes are found in a great variety of places, such as rock-strewn hillsides, stone walls, edges of ponds and streams—any place where they can find food and cover, and where ignorance and prejudice have not combined to destroy them.

SLATS SERVE AS DOORMATS FOR Y. M. C. A.'S IN CAMP

Heavy slats, spaced a suitable distance apart, form part of the porch floor at the entrance to Y. M. C. A. buildings in various army camps and take the place of doormats. This arrangement has been found preferable to steel scrapers or mats because of the hobnails in the soldiers' footwear. Walking over the slats, it is easy for one to scrape the dirt from his shoes.

USE ELECTRIC SHOVEL TO CLEAR STREETS

In the city of Milwaukee, Wis., the problem of removing excessive amounts of snow from the streets last winter was solved by utilizing an electric shovel. This machine, which does the work of several score of men, is similar to those used in excavating dirt except that it has a much larger scoop. The shovel loaded directly into large cars drawn alongside.

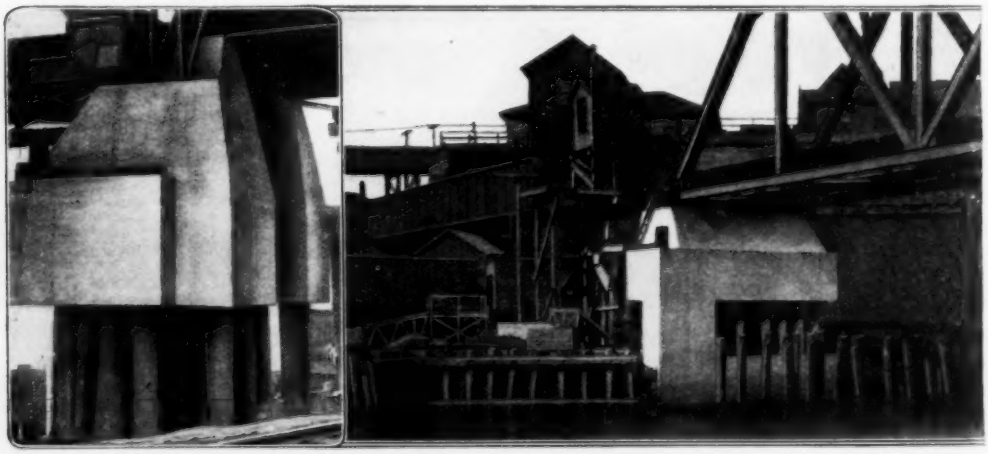
Electric Shovel Employed in Milwaukee to Remove Snow from the Streets

HUGE COAL BIN IN LAKE URGED FOR CLEVELAND

Having last winter's coal famine fresh in mind, an official of Cleveland has proposed that the city build an underwater concrete storage bin in Lake Erie in which 15,000 tons of coal could be kept. The coal could be bought during the summer and would not be endangered by possible spontaneous combustion or subject to losses from other causes, it is pointed out.

CONCRETE PILING OBVIATES SUBAQUEOUS CONSTRUCTION

Reconstruction of a bridge pier, rendered necessary by dredging operations in the Cuyahoga River, was effected in a novel manner by railway engineers a short time ago. The likelihood of having to move or replace the structure some time in the near future, because of a river-straightening project, brought the cost element well to the foreground. Therefore, instead of employing a more expensive form of construction the engineers had a number of reinforced-concrete piles driven to the necessary depth and bound at the water line and top by concrete. For additional stability, a column was built at one corner to connect the upper and lower slabs.



The Concrete Piles were Tied at the Water Line and Top by Poured Concrete and the Two Slabs Thus Formed Connected by a Corner Column, as Shown at the Right. The Other Picture Gives a Close View from One Side

BEDDING AND FABRIC MADE WITH PREPARED CORK

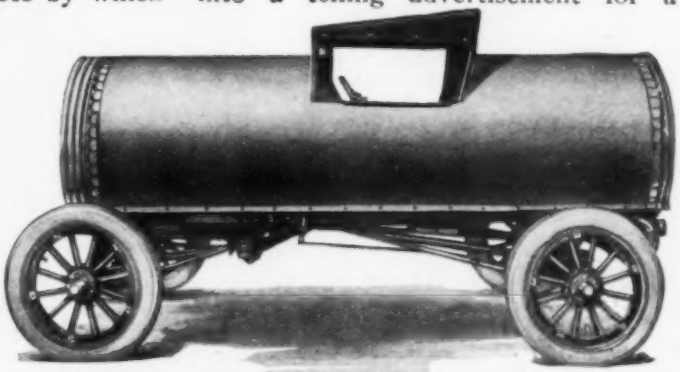
Concerns in Spain have recently developed ingenious processes by which cork can be employed for new purposes. In one case it is treated in such a way that it may be used as a substitute for wool in the manufacture of quilts, mattresses, cushions, and the like. Besides being lighter than wool, the makers contend that it is cleaner. Another use of cork is in connection with the making of textiles. It is reduced to a very fine dust and also treated with chemicals to get rid of any resin content and to make it more pliable, after which it is spread in a thin layer between two thicknesses of cotton fabric and subjected to repeated pressure.

SUBMARINE CHASER MAKES GOOD IN TEMPEST

Discouraging rumors concerning the seaworthiness of America's 110-ft. submarine chasers have been completely discredited by the remarkable performance of one of the craft in the hands of a French crew. The boat became separated from its convoy during a storm some weeks ago that is pictured as having been one of the worst ever encountered on the Atlantic. For days nothing was heard of the chaser and it was given up as lost. Here, in the words of Secretary Daniels, is an illuminating account of what happened: "In the storm the engines were disabled and the boat was left adrift far out at sea. The crew managed to rig up a sail made of bedcoverings and were able to make two or three knots before the wind. There were no navigating instruments, except a compass, aboard, and the crew had to estimate their position. They sailed for 39 days, and finally reached port."

AUTO BODY RESEMBLES TIRE-PATCH CAN

A light car has been transformed into a telling advertisement for a brand of tire patches, by equipping it with a body resembling the can in which these patches are sold. Sheltering the driver's seat are a regulation roadster top and a windshield, cut to fit the curved body. In addition to having a view through the windshield, the occupants can see through the front end of the body. Sleeping accommodations are provided back of the driver's seat.



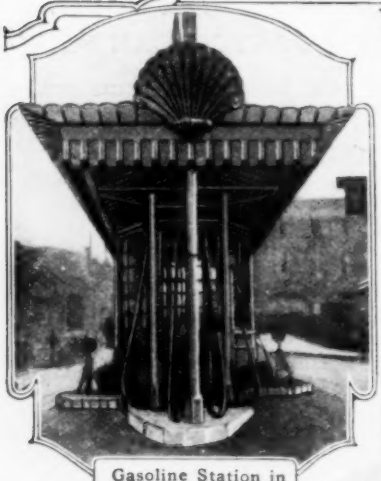
The Special Body on This Car Is an Advertisement for Tire Patches and was Built for Long-Distance Touring. The Gasoline Tank, Placed at the Rear, Necessitates a Vacuum-Feed System

STORE ALMOST ENCIRCLED BY FRUITFUL OLD VINE

Almost encircling an old frame store building in a far-western town is a prolific grapevine which was planted by pioneers over 70 years ago. It is 8 in. in diameter at its base and 125 ft. long. Last year nearly 500 lb. of grapes were harvested from it.

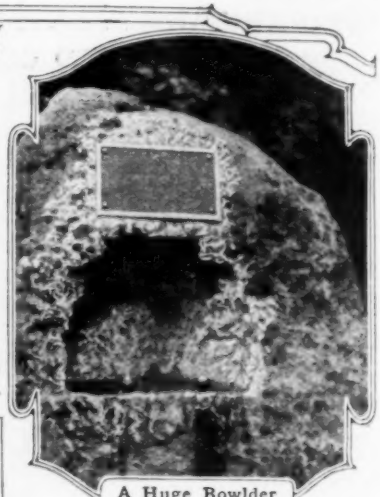
Left: The Base of the Old Vine, Eight Inches in Diameter. Right: Part of the 125-Foot Grapevine can be Seen Extending along the Side of This Old Store

CIVIC FEATURES THAT PROMOTE THE COMFORT



Gasoline Station in Seattle That Is Artistic: The Walls Are of Clear Glass and the Roof of Colored Glass. All Equipment Is Up-to-Date

Massive, Ornamental Post Marking a Street Corner in a Los Angeles Residence District: It is Made of Cobblestones Set in Cement



A Huge Bowlder near the Columbia Highway, in Oregon, Fashioned into a Drinking Fountain with Sanitary Bubbling Faucets

A Rose Hedge Separates the Highway from This Electric Line in California, While between the Hedge and the Tracks a Fine Crop of Pumpkins is Grown

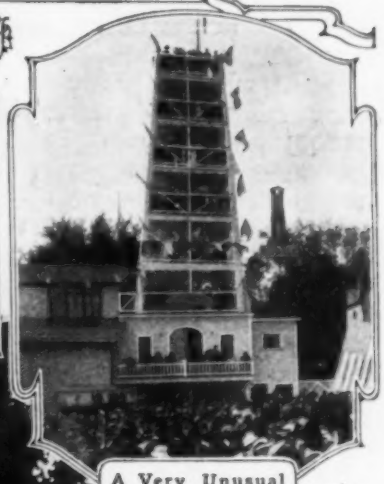
Ocean Park, California, Reserves Space for Motorcyclists, and Little Wonder, for 1,400 of Them Sometimes Park in This Street at Once

An "M" and a "T" Made into an Unmistakable Design to be Used in Marking the Mackinaw Trail in Michigan

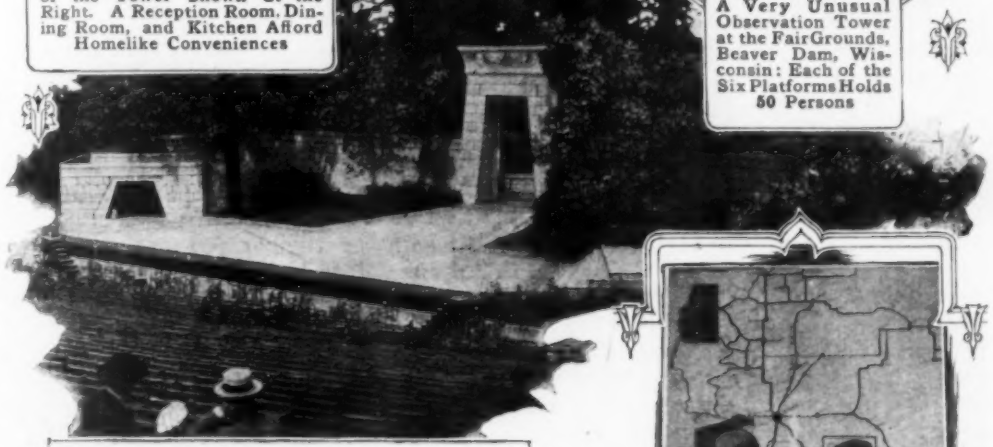
Shooting Compartment in the Rifle Range at San Antonio, Texas, a Municipal Institution Serving a Patriotic Purpose: An Army Officer Is in Charge and Acts as Instructor

AND ENJOYMENT OF RESIDENTS AND VISITORS

Interior View of Second Floor of the Tower Shown at the Right. A Reception Room, Dining Room, and Kitchen Afford Homelike Conveniences



A Very Unusual Observation Tower at the Fair Grounds, Beaver Dam, Wisconsin: Each of the Six Platforms Holds 50 Persons



Municipal Outdoor Theater in a St. Louis Park, Where Every Season Thousands of Citizens and Visitors are Entertained by the Presentation of Classic and Modern Plays and Pageants: The Stage is Given Added Beauty Because the Background of Green is Composed of Living Trees, Vines, and Shrubs

A Big Weatherproof Map Painted on Metal, Located near the Free Camping Area for Motorists, in a Denver Park: With It a Stranger can Readily Locate Points of Interest in the Region and Learn How to Reach Them

Motorists Find This Bathhouse of Canvas, Covered with Cedar Boughs, a Great Convenience. It Is on Little Bear Lake, California

VALUE OF TRADE-MARKS IN THE FAR EAST

Why Attempts at Protecting Branded Goods have Failed in the Orient, and How the Situation can be Remedied

By F. H. WILLIAMS

Trade-Mark Specialist

THE trade-mark files in the custom-house in Shanghai, China, may be considered the greatest commercial cemetery in the world. On May 1, 1917, they contained over 12,000 trade-marks registered by firms from all parts of the world, not one of which complied with the requirement of advertising to the Chinese merchants that they were registered and recorded.

Of a still greater number, less than 400 had been properly recorded at Tientsin, China, where was located the only office that would properly forward copies of trade-marks to the authorities in Peking. Only 50 of these were properly advertised as recorded.

Having been commissioned by the governor of Ohio, in 1916, to investigate trade conditions in Russia and China and to study the trade-mark situation, I am able to state the results of personal investigation in those lands. I believe strongly that we can regain much trade in the Orient, but the requisites are, first, able personal representatives; second, catalogs printed in the language of the prospective customers; third, well-trained foreign-trade assistants in the home office, and fourth, adequate protection for trade-marks, whether the business is large or small at the outset.

In considering the protection of one's foreign trade one must know what makes an appropriate trade-mark for a country like China, for example. Many marks developed at Manchester for cotton goods are excellent. Here are a few: Archer on horse; lion, eagle, and globe; dragon and stork; Chinese soldier; girl and waterfall; fishing boat; king and pheasant; unicorn; red bell; five stars; gold sun; stag and monkey, and so on. All of these are good, but doubtless most of them have never been properly registered and advertised. One can readily see the folly of depending on trade-marks for Chinese trade, which have not been taken out in compliance with the laws of China.

When a trade-mark has been properly recorded and advertised in China the officials there have shown themselves willing to give the owner ample protection. At the present time only about 50 registrants of trade-marks from outside China have complied with the regulations. There are some 3,200 infringements of American trade-marks in the Far East, due largely to inefficiency in handling the cases, particularly in writing the specifications.

The practice of infringing on American trade-marks is spreading to Japan, though not among high-class manufacturers. While many American manufacturers feel that they have not been treated justly in Japan, I found that in most cases they had neglected to register their trade-marks, though often doing business in the country for years.

My own opinion is that if there is any prospect of doing business in the Far East, one's trade-mark should be registered in Japan at once, rather than wait until business has grown larger.

EVIDENCE OF NEW COPPER FIELD IN CANADA

Indications of the presence of copper deposits over a large district in northern Canada have of late attracted attention. Study of specimens has given rise to the belief that the geological formation is similar to that of the Lake Superior region, renowned for its highly productive mines. The new area lies east of Great Bear Lake and seems to follow the course of the Copper Mine River, which discharges in Coronation Gulf. Reports of evidences of copper have come from points as far east as Bathurst Inlet, and also from Victoria Island. The possibility of there being a great copper field somewhere in the region seems strong.

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PROPOSED NATIONAL POWER SYSTEM FOR BRITAIN

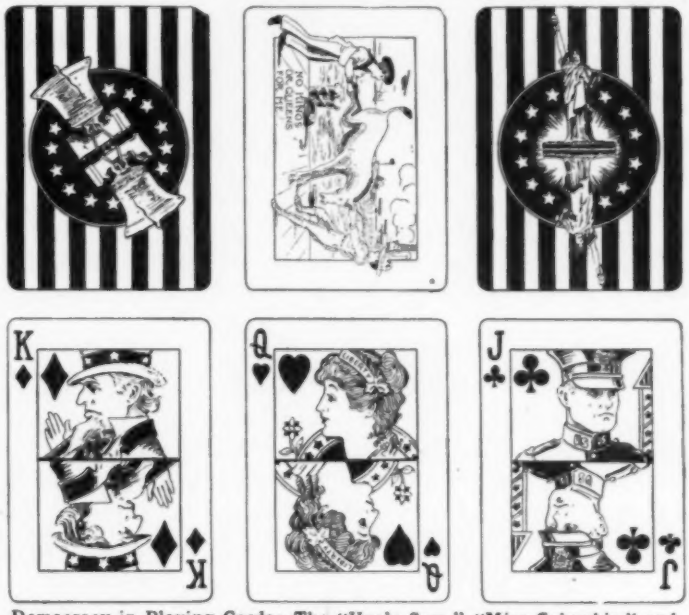
It is proposed to run all of the machinery and railways in Great Britain by electricity obtained from one vast power system. It is claimed that under this scheme factory chimneys would be a thing of the past, and smoke would almost entirely disappear from towns and cities. Startling as the project is at first thought, it is receiving very careful consideration by England's ablest engineers. The proposal is contained in a report by a subcommittee of the committee on reconstruction after the war. The document states that a saving of 50 per cent in the cost of power to the consumer and an immense saving of coal would be made by the change.

In place of some 600 power companies and municipal plants now in existence, the committee's engineers would divide the entire country into 16 districts, each with one or more plants big enough to produce power in the most economical fashion. The plan involves far more than the mere centralization of existing companies under one management, for it would make possible the development of the country's total electrical output to 10 or even 20 times what it is today. It is declared that by first turning the coal into electricity and then employing the latter to run the factories, the country could save about three-fourths of the present coal consumption.

One way, manufacturers find, to meet present demands for higher pay is by using more mechanical power and this, of course would be entirely practical if electricity were cheaper.

BANISH KINGS AND QUEENS FROM PLAYING CARDS

Kings and queens have suffered a new setback at the hands of demonstrative democrats. An American artist has designed a pack of playing cards from which royalty has been banished, its place being taken by "Uncle Sam," and "Miss Columbia," while instead of the jacks are "American soldiers." A cartoon on the joker bears the motto "No Kings or Queens for Me." One design for the backs includes two conventionalized Liberty bells. "Three Uncle Sams and a couple of soldiers" would be the new way to designate three kings and two jacks.

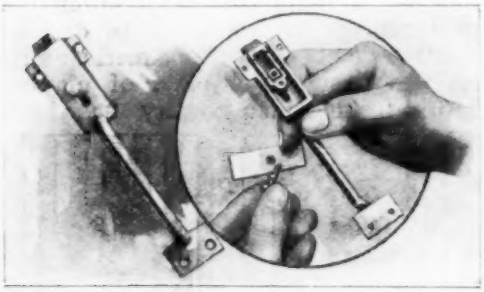


Democracy in Playing Cards: The "Uncle Sam," "Miss Columbia," and "American Soldier" That Take the Place of the King, Queen, and Jack. An Appropriate Joker and Two Designs for the Backs are Also Shown

CASEMENT-WINDOW HANDLE AND LATCH COMBINED

A serviceable article of building hardware which is a combination of a spring latch and a handle, has been designed for casement windows. One of the two ends, through which screws are inserted to fasten the handle to the window sash, is especially shaped to serve as a case for a spring-held bev-

eled catch, that can be installed with the beveled side facing in or out, according to the way the window opens.



Combination Latch and Handle for Casement Windows

By means of a knob screwed into the side of the catch, the latter can be released from its socket in the casing when the window is to be opened.

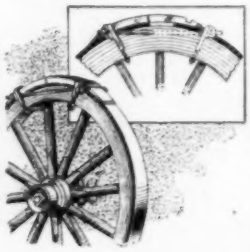
ALLIES WOULD BUILD RAIL LINES AROUND ENEMIES

Travel by rail from London to Bombay and Calcutta will be a possibility if plans now being agitated in Europe are realized. The step in this pretentious program of rail development on which immediate stress is being laid is the construction of two rail routes from western Europe to Russia, that would not pass through Germany.

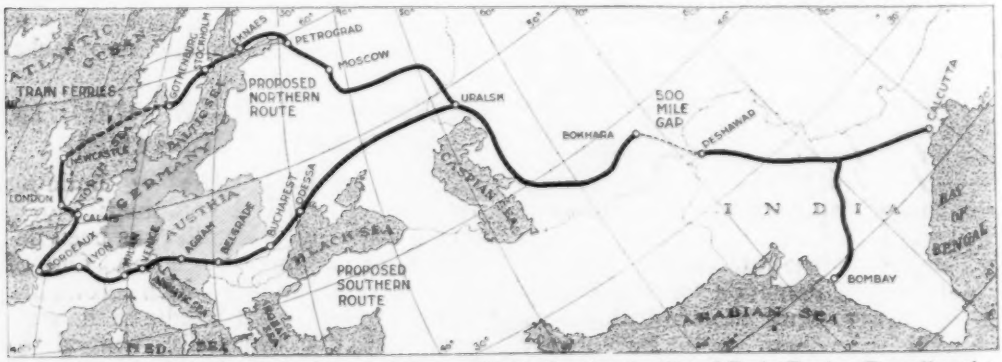
The so-called northern route planned would connect London and Petrograd. Through trains would travel by ferry from Newcastle to Gothenburg, Sweden, thence by rail to Stockholm, from which point they would again be taken by ferries to a line in Finland. The proposed southern route would run from Bordeaux, France, to Lyon, and then through a new tunnel under the Alps to Milan. Agram, Belgrade, Bucharest, and Odessa would be the remaining principal points on the route. When these two lines were completed the gap between the Anglo-Indian and the Russian railways could be filled. Then, with the much talked of tunnel under the English Channel constructed, one could travel from London to India without changing cars.

ATTACHMENT FOR MENDING STEEL TIRES

A serviceable device for temporarily mending metal tires consists of a curved steel plate that is fitted over the break and held in place by two U-shaped clamps which engage notches in the edges of the tires. By means of bolts with nuts at either end, the clamps and tire ends are drawn toward each other, after which the clamps are tightened and the connecting bolts removed.



¶The Signal Corps asks that all persons refrain from shooting pigeons, as the birds killed may be among the large number now being trained for service with our army abroad.



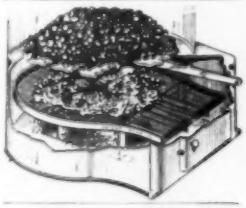
From London to India by Rail: Proposed Routes Which Involve the Use of Train Ferries, Tunneling the English Channel, and Filling Gaps with New Rail Lines. Germany is Completely Encircled

GRAPE SEEDS A SOURCE OF FUEL FOR FRANCE

Calculations that are of special interest in view of the shortage of coal in France, have been made in connection with the proposal to utilize as fuel the large amount of seeds that are derived from pressing grapes. The wine presses of that country produce an average of 1,321,000,000 gal. per year. The by-product in the form of seeds amounts to about a pound and a half per gallon. After making proper allowance for the difference in the fuel value of the seeds and coal, it appears that, theoretically, the grape industry of France yields seeds equivalent to some 176,000 tons of coal.

ASH SIFTER IS INSTALLED UNDER FURNACE GRATE

The work of sifting ashes is considerably lessened by using a recently designed screen installed under the furnace grate. Ashes shaken on it from above are easily sifted through it by using a scraper, while unburned or partly burned fuel is saved and can be used to bank the fire. All dust raised in sifting by this method goes up the chimney.



DEVICE FOR EJECTING PEN FROM PENHOLDER

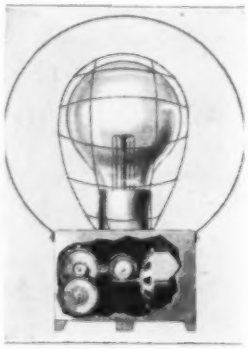
A device has recently been invented with which an old pen can be ejected from a penholder without soiling the hands. It consists of a short piece of metal, curved to fit below a slot in the casing around the end of the holder. By pushing on a knob projecting through the slot, the pen can be easily removed. Even badly rusted pens can be ejected by this means.

SOLVING THE SUBMARINE PROBLEM

The jumping liner clearing a torpedo which has just been fired at it.

ELECTRIC LANTERN HAS ITS OWN GENERATOR

For use in all kinds of weather on farms or in camp, an electrical lantern has been designed which operates mechanically. A spring motor, that winds like a clock or phonograph, together with a governor, is employed to run a small motor that supplies current to a 12-cp. bulb. The motor and generator are inclosed in a base measuring 6 by 8 in. Wire guards are provided about the bulb and there is a bail for carrying the lantern which stands about 12 inches high.

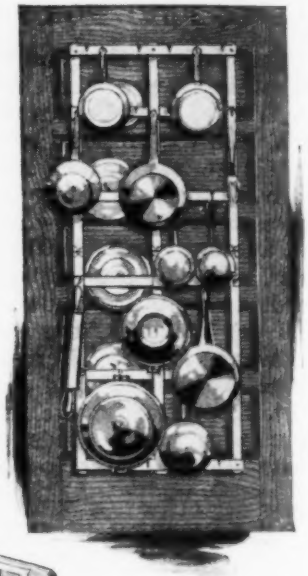


SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

The Service-Flag Idea Applied to an Electric Lamp

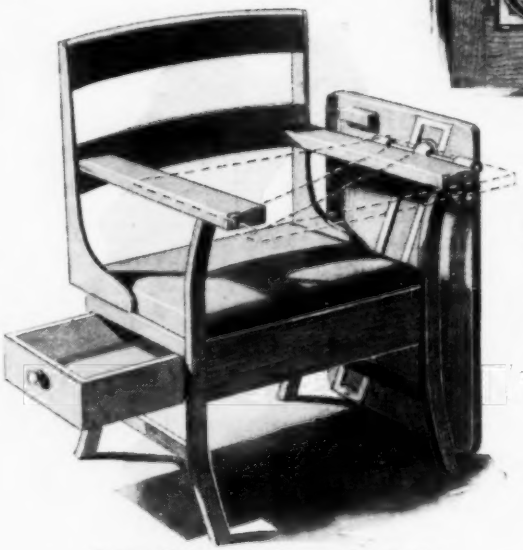
Ribbon Bracelet with Service-Flag Locket That Holds as Many Pictures as It Has Stars. Price $16 and More

Gold-Finished Locket with Service Flag in Colored Enamel. Price $2.50

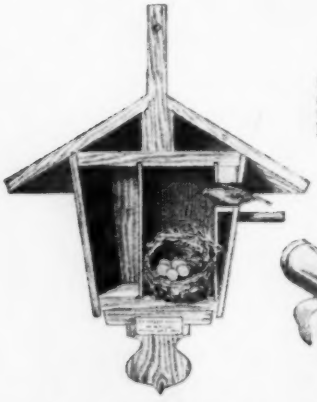


Adjustable White-Enameled Rack with Sliding Hooks for Kitchen Utensils: Attached to a Door or Wall, It Saves Shelf Space. Price $2

This Arch Support may be Adjusted to Meet the Individual Requirements of the Wearer

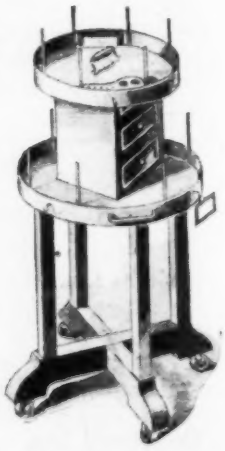


Study Chair with Drawer for Books and Papers, and a Table on Which One may Write or Draw: The Latter Drops to the Side When Not Needed

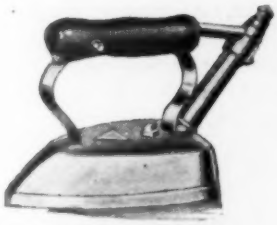


The Nesting Place Is Entirely Separate from the Outer Walls and Roof of the Bird House and Remains Cool and Healthful in Summer

For Soldier or Traveler: Checkerboard Made of Pliable Rubber So as to Roll Compactly. Price $1.25



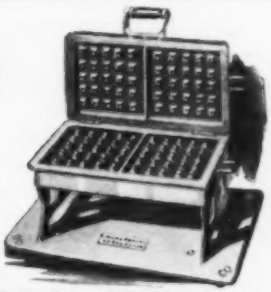
The Upper Part of the Sewing Stand, Consisting of a Cabinet between Two Trays, Revolves. Articles may be Suspended from the Pegs



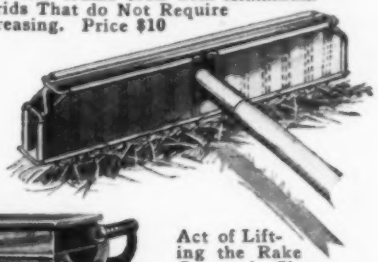
Push Button in Side of the Handle of This Electric Iron Controls Current

Showing the Interior of the Knitting Bowl, Which is Supplied with Pegs

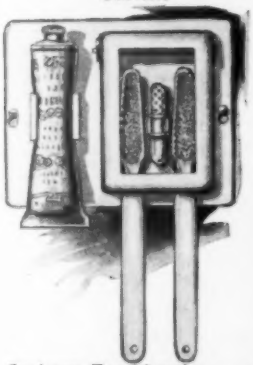
Knitting Stand Provided with Arms That Hold Yarn While It is Wound into a Ball. Price $12.50



Electric Waffle Iron with Aluminum Grids That do Not Require Greasing. Price $10



Act of Lifting the Rake Causes the Cleaner to Free the Prongs from Grass and Weeds. Price 50 Cents



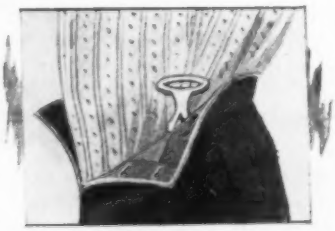
Sanitary Toothbrush and Dentifrice Holder for Toilet-Room Installation. Price 50 Cents

A Phonograph Cabinet, in Adam Style, Designed on the Lines of a Tea Wagon: Its Portability Makes It Splendid for Porch and Garden Use. Price $200

Combination Comb, Ruler, Pencil Holder, Envelope Opener, and Nail File

Curved, Double-Pointed Rubber Knitting Needle, a New Accessory for the War Worker

Convenient for Kitchen and Sick Room: A Half Teaspoon for Measuring Liquids and Solids. Price, Nickel-Silver, 25 Cents



Small Metal Grip Engages Shirt Seam and Holds Trousers in Place, Allowing Belt to be Worn Loosely

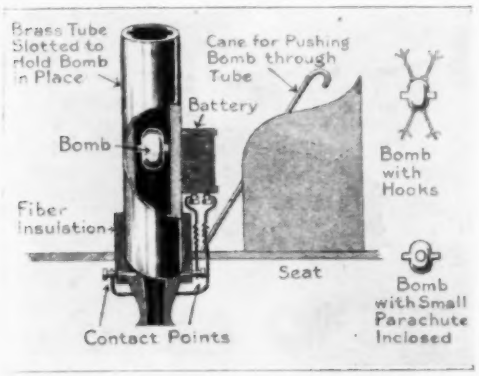
Coil-Spring Device for Holding Washboard in Stationary Position without Requiring One to Lean against It

Tube of Shoe Paste Provided with a Leather Dauber: Stopper in End Prevents Polish from Leaking

ELECTRIC-LAUNCHING TUBE FOR AERIAL BOMBS

By AVIATOR HENRY A. BRUNO, R. F. C.

WHAT has happened to the Zeppelin? Perhaps you yourself have asked this question. Only a short time ago Zeppelin raids over England were a common occurrence—today the raiding is done by squadrons of German aeroplanes, huge affairs carrying



The Bomb is Prevented from Turning Over, as It is Ejected, by Two Grooves in the Launching Tube through Which It is Pushed with an Ordinary Walking Stick

large quantities of bombs and flying at a tremendous speed. Strange as it may seem, it is not the anti-aircraft guns that have driven this nocturnal raider from the sky, but pilots of the allied air fleets using fast one-man fighting scouts equipped with a simple device known as an electric-launching tube.

This comprises a brass tube, set between the pilot's legs and protruding through the bottom of the aeroplane's fuselage. This tube has two grooves cut into it so as to keep the bomb from turning over as it emerges from the tube. At one side of the tube is a battery connected to two terminals at the bottom. There are two contacts on the bomb, and when it reaches the bottom of the tube a connection is established between these two terminals, causing the bomb to explode a few seconds after it leaves the tube.

Night flying is always hazardous work, but attacking a Zeppelin in the dark requires more than ordinary nerve. When the alarm is sounded and pencils of light from the searchlights flash back and forth across the sky, accompanied by the detonations of the anti-aircraft guns, the night-flying pilot climbs into his machine, and after receiving the latest information as to the possible location of the Zeppelin, ascends into the darkness. He climbs fast in order to get above his own batteries and away from the bursting shells.

Stacked neatly beside him are the small hand bombs, incendiary flares, and parachute flares, and an ordinary walking stick, which he uses to poke the bombs through the tube. You can easily imagine what would happen if one of them should stick in the bottom of the tube and explode. He takes no chances on it—hence the use of the stick.

He finally locates the Zeppelin, as it is picked out by one of the vivid searchlight beams from the ground. A thousand or more feet above the cumbersome airship he climbs, so as to be out of the way of its machine guns, and in a favorable position to drop his bombs.

Maneuvering so as not to be exactly over his target, he launches several flare bombs. One after another they pass through the tube, explode and drop to earth—some white, others red and green. He is signaling the anti-aircraft guns that he is going to attack, and the bursting shells which have been pouring skyward cease to come. The searchlights flicker around the sky, once his machine is caught, and the men in the Zeppelin see him and realize their peril. Their only chance is to rise above the plane and try to escape in the darkness.

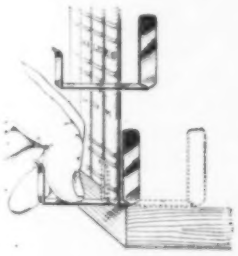
This time the pilot places an incendiary bomb in the tube, then another and another. Down onto the envelope of the Zeppelin they fall, burning fiercely. These bombs are surrounded with fishhooks, and once these become entangled in the airship, they stick worse than glue. An explosion follows and the aeroplane plunges wildly in the upward rush of air. Peering over the side, the pilot sees the giant Zeppelin falling earthward in flames, like a mighty comet. His work com-

pleted, he flies back by compass to his aerodrome, hands in his report, and a few minutes later is sound asleep in his quarters.

The records of the Royal Flying Corps contain reports of many encounters such as these; the exact number, of course, has not been made public, but you can readily surmise to what extent the Zeppelin fleet has been depleted by the fact that a Zeppelin raid now is a rarity instead of a common occurrence, as it used to be.

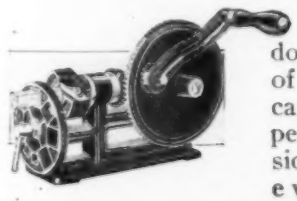
METAL BOOKMARK SERVES DOUBLE PURPOSE

A book may be removed without difficulty from a well-filled shelf by using a new bookmark, consisting of a metal band, bent in the shape of a "U" having legs of unequal length. The longer leg is turned edgewise with respect to the other and serves as a mark between the leaves, while the shorter one projects in front of the book when on the shelf, offering a handy means for withdrawing the volume.



HAND MACHINE CUTS DOWELS FOR PARTICULAR WORKMEN

With the aid of a small hand-operated machine, designed for cabinet and pattern makers, dowels and rods of varying sizes can be cut to perfect dimensions in whatever kind of wood is being worked. If kept in stock for any time dowels have a tendency to shrink and warp. The instrument overcomes such trouble by enabling workers to manufacture their own supply.



DEVICE FOR COMPRESSING CORN SHOCKS

The use of a new tool consisting of a rod and a crank handle saves time and labor in compressing corn shocks so that they will not fall down when tied. The rod is thrust into the shock, after which a rope with a hook at either end is passed about the bundle of stalks and hooked to the tool. By turning the latter the rope is wound tight about the stalks so that they can be tied easily.

TRIPLE WRIST WATCH FOR ARMY MEN

A wrist watch for army officers has been devised equipped with a special case in which are set three watch movements. Accuracy to the second being so essential in many military operations, this triple timepiece enables the wearer at least closely to approximate the correct time by taking the average indication of the three.

NONFREEZING WATER TANK FOR FARM ANIMALS

A nonfreezing water tank for farm stock, which has recently been developed, consists of a heavy steel cylindrical frame, covered with galvanized iron and containing two pans below, for hogs and sheep, and a tank above, accessible through two openings in the

top, for horses and cattle. Two lamps in the lower part of the outfit keep the water from freezing. Adjustable floats

Exterior and Phantom Views of Nonfreezing Water Tanks for Large and Small Farm Animals

regulate the flow from the supply pipe so that a desired level is maintained.

DEALER'S HUMOR AN AID IN COLLECTING BILLS

A humorous appeal, no doubt quite as effective as a more serious one would be, appears on the billheads used

An Out-of-the-Ordinary Billhead Which Almost Any Debtor would Hesitate to Ignore

by a farm-implement dealer. At the top of each sheet is a picture of the dealer's three little children and beside it this legend: "Dad is Broke. Please Settle at Once."

GUN CAMERA OPERATED LIKE A RIFLE

A recent invention designed particularly for certain kinds of outdoor photographic work is a camera mounted on a support resembling a gun. With this attachment the camera can be accurately aimed and time or instantaneous exposures made. The camera shutter is actuated by pulling the trigger of the gun, the two being connected by a spring-held rod and other mechanism, which give the photographer the necessary control in making exposures.

Camera with a Gunlike Support Which is Aimed and Operated Like a Firearm

TUNNEL GIVES VENEZUELA CAR LINE EASY GRADE

Among the interesting railway-engineering projects that are being carried out in Venezuela is a 1,640-ft. tunnel that will give the Caracas electric tramway a uniform two-per-cent grade as it leaves the capital. In the past it has contended with a gradient ranging from six to eight per cent in ascent, followed by a drop of 984 ft. In order to prevent pedestrians from using the tunnel, and also to provide sufficient height for a conductor cable, the bore is being given an elongated oval section. By this arrangement no passageway is left on either side of the track. The necessity of timbering is obviated by the cohesive character of the formation, which consists of schist, limestone, and clay.

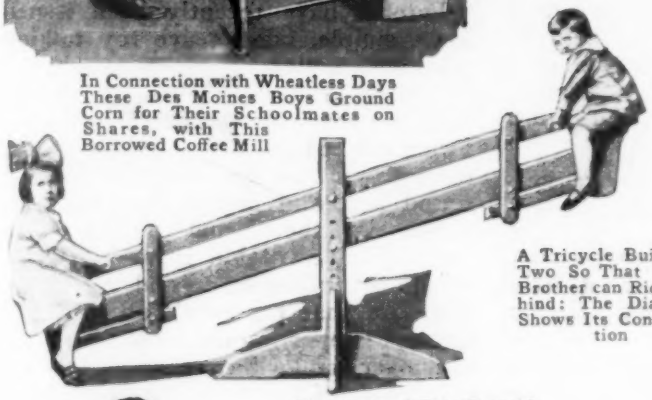
SWISS MIX WOOD AND COAL IN MAKING GAS

At various points in Switzerland and France wood and sawdust are being mixed with coal in making gas, because of the coal shortage. For example, 10 per cent of sawdust is added to the coal in the vertical-bulb retorts in Geneva, while as an alternative for the sawdust, logs are sometimes used. In such cases the retorts contain about 260 lb. of coal instead of 1,240 lb. The acid products from the wood have caused some trouble because of corrosion, but this has been largely overcome by alternating charges of wood with charges of coal. In another Swiss city, 375 lb. of sawdust is mixed with 66 lb. of coal in retorts that usually take 990 lb. of coal.

GLIMPSES OF CHILDREN AT WORK AND PLAY

In Connection with Wheatless Days These Des Moines Boys Ground Corn for Their Schoolmates on Shares, with This Borrowed Coffee Mill

The Schoolboy Millers Sifting the Corn Meal: They Sold Their Share at a Low yet Profitable Price



The Seats of This Portable, Easily Operated Teeter Always Remain Level. They Rise and Fall Four Feet

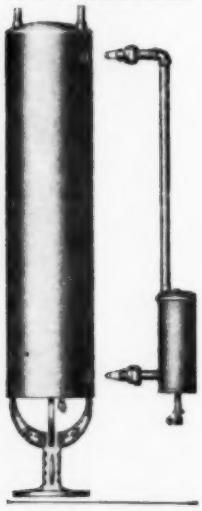
A Tricycle Built for Two So That Little Brother can Ride Behind: The Diagram Shows Its Construction

One of Boston's New Messenger Girls Who are Said to Be Even More Active Than Boys

A Child's Store Featured in a Large Retail Establishment: Here Children can Buy Articles for a Few Cents, the Currency Used Being Paper Money, Given with Each Dollar's Worth Purchased in the Big Store

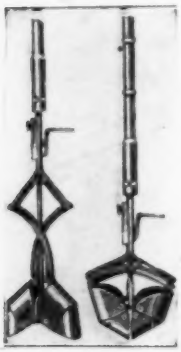
SIMPLIFIED TANK COUPLING EXPEDITES INSTALLATION

For connecting water heaters to galvanized-iron tanks, a novel coupling has been introduced which is supposed to facilitate installation and obviate the need of a small dealer carrying a large assortment of pipe, fittings, and dies. The device is supplied with spring-controlled lugs that expand after insertion through a hole drilled in the shell of the container. A washer is held in place on the outside by a friction plate and locknut.



HAND POST-HOLE DIGGER HAS AUTOMATIC PARTS

The labor of making post holes, cleaning catch basins, etc., is greatly lessened by using a new digger which consists of a straight handle having at its lower end two metal scoops hung pivotally, facing each other. One end of a set of levers is attached to the upper edge of the scoops and the other to a plunger extension of the handle. Downward pressure on the handle forces the scoops into the ground, bringing them into a locked position, full of dirt and with their lower edges together.



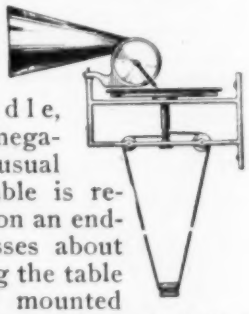
¶During the coal famine pecan shells were burned for fuel in New Orleans. It has been found, too, that they contain enough protein and fat to be used, ground, in making stock feed.

CANADIAN SERVICE FLAG ADORNED WITH LEAVES

The idea of the service flag, so popular in the United States, is being adopted in Canada, and what is said to be the first Canadian emblem of this sort was recently unfurled in a Toronto church in honor of nearly 300 of its men who had joined the colors. In place of the stars on the white background there are maple leaves, the Canadian emblem. All of these, save a group near the center, are scarlet. The central group is purple, signifying the number of men killed in the war.

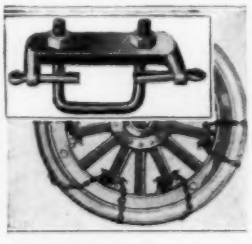
TOY PHONOGRAPH OPERATED BY HAND

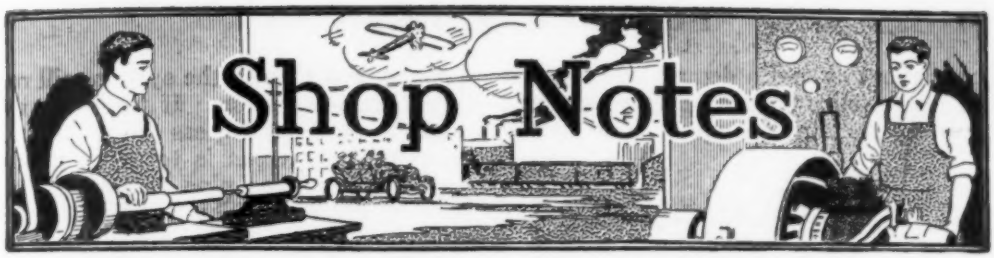
Patents have recently been issued for a simple, inexpensive toy talking machine which is operated by hand. Sound is transmitted through a needle, sound box, and megaphone in the usual way. The turntable is revolved by pulling on an endless cord that passes about the post supporting the table and over pulleys mounted either side of the post, thus obviating the necessity of a spring motor.



CLIPS ALLOW SKID CHAINS TO CROSS TIRE AT ANGLE

Traction chains that cross truck tires angularly, like cleats on the driving wheels of tractors, minimize shocks and increase road-gripping efficiency. With forged-steel clips, specially designed for the purpose, fastened to alternate spokes, any style of ordinary chain may be applied in this manner, or in other ways, as shown above.





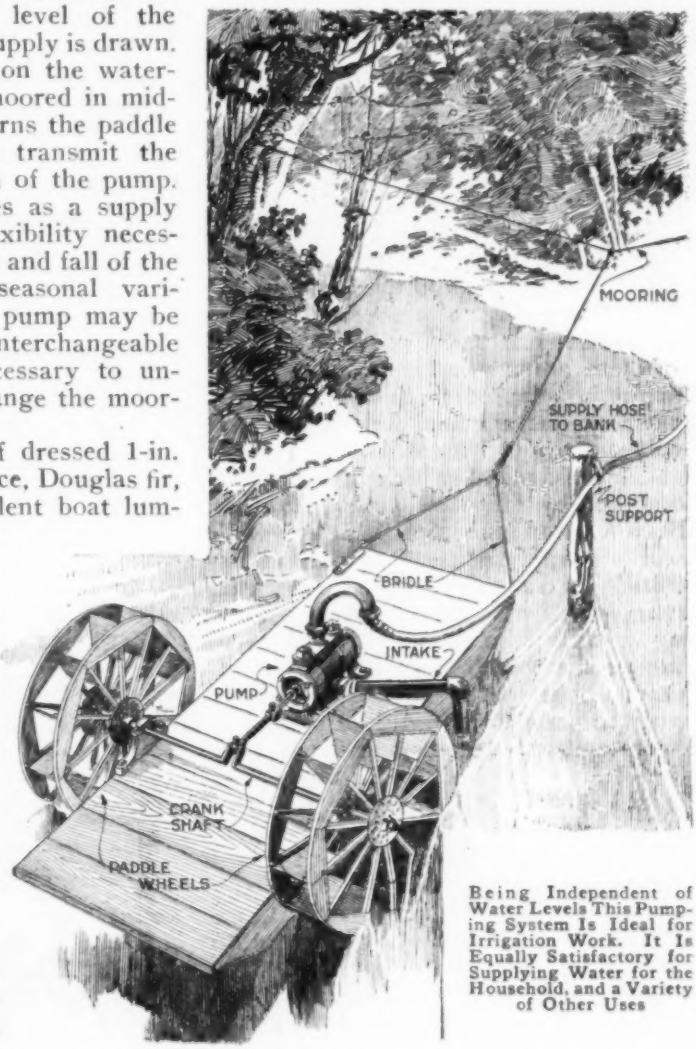
Hydraulic Pump Is Independent of Water Levels

By S. D. HOOPER

THE pumping system illustrated overcomes the limitations of water wheels and hydraulic rams due to fluctuations of the level of the stream from which the supply is drawn. The pump is mounted on the watertight deck of a barge moored in midstream. The current turns the paddle wheels, which in turn transmit the power for the operation of the pump. An ordinary hose serves as a supply line and affords the flexibility necessary to allow for the rise and fall of the stream according to seasonal variations. If desired, the pump may be used at two or more interchangeable points. It is only necessary to uncouple the hose and change the moorings.

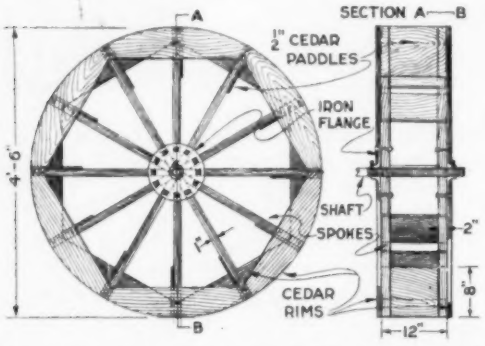
The barge is built of dressed 1-in. stock. White pine, spruce, Douglas fir, and cedar are all excellent boat lumber. The dimensions are 12 ft., over all, beam 4 ft., and depth 16 in. The bottom boards should be tongued and grooved, and for ease of construction laid the short way. The finished boat is calked with white lead and given two coats of good paint. Galvanized-iron boat nails should be used. Ordinary wire nails will rust out.

The paddle wheels are constructed from 1-in. boards, with the exception of the blades, which are of galvanized iron or wood. These are placed about two-thirds of the over-all length aft so as to trim the boat properly. Paddles 8 in. wide will develop sufficient power for ordinary needs in a stream that is moderately swift. In a sluggish stream,



Being Independent of Water Levels This Pumping System Is Ideal for Irrigation Work. It Is Equally Satisfactory for Supplying Water for the Household, and a Variety of Other Uses

or if great power is demanded, the size of the paddles should be increased according to requirements. The crank



Construction Details of the Paddle Wheels: The Metal Fitments Are Few and Simple. They may be Made in the Home Workshop or Purchased at Any Machinery Supply House

in the center of the shaft will, of course, be half the stroke of the pump piston in length. By elevating the shaft bearings the necessary clearance is provided for the crank without the necessity of making a depression in an otherwise solid and level deck.

There are a number of pumps that might be adapted to this use, but the most satisfactory one, and the one that will meet most requirements, is the usual tank pump which is ordinarily operated by means of a vertical lever. Such a pump is obtainable at any well-stocked supply house. The pump illustrated has a capacity of 1,000 gal., that is, it will throw 1,000 gal. of water an hour to a height of 20 ft., with the paddle wheels turning 100 revolutions a minute. Details of the pump, and the paddles that will be needed to operate it, are, of course, decided by the conditions under which the system is to be used.

The supply hose should be supported by a stake or stakes driven in the bed of the stream, or by slings from any convenient overhanging limbs. Careful attention should also be given to the barge moorings. There should be plenty of line to allow for fluctuations of the water level, and the stability of the barge will be increased if the line is attached as shown in the illustration.

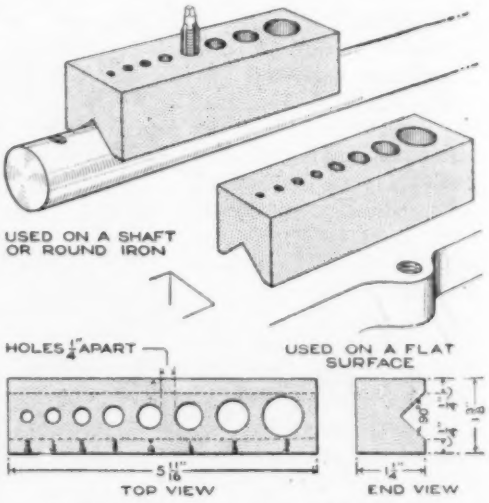
Once well placed, the system will require little attention. If there is any doubt as to the tightness of the hull, an excellent precaution is to fit an auxiliary intake of gas pipe leading to the floor of the hull. This should be provided with a shut-off valve, which is opened if it becomes necessary to bail out the boat.

An Economical Type Gauge

Printers not possessing a standard type-high gauge will find a convenient and accurate substitute in an old screw composing stick. By setting the knee of the stick to a large type the stick may be used as a gauge, the etching entering far enough into the jaws to insure accuracy. A mark should be made at the point where the type sticks fast to the jaws, and this mark used to gauge the cut. The stick may also be used as a caliper.—George Parke, Mount Morris, Ill.

Blocks for Starting Taps Squarely

Cutting female threads is often difficult because of the tendency of the tap to take a bad start. By the use of a steel tap guide, as illustrated, faulty starting of the threading tool is impossible. The tap is held in correct

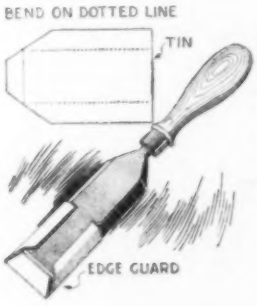


If the First Few Threads are Cut Properly the Others Follow Their Lead

alinement until the first three or four threads are cut, after which the guide may be removed. This tool is especially useful in tapping threads in shafting, or any other round-surfaced stock.

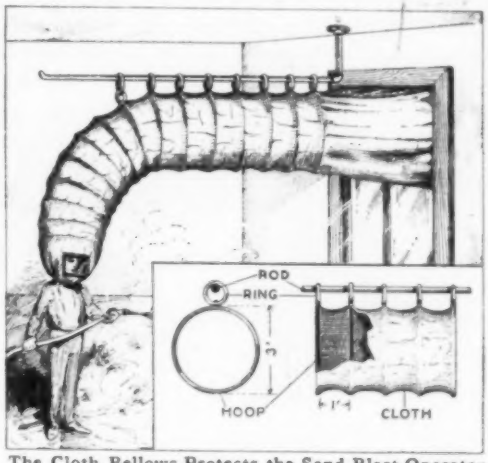
Tin Guards for Edges of Chisels

When wood chisels are properly guarded, much time can be saved in resharpening because the edges are not nicked from contact with other tools, on the bench or in the tool box. Metal guards, as shown in the sketch, were found superior to leather ones. They can be made easily from light tin, or sheet metal, cut to the shape indicated and folded on the dotted lines. The upper portion of the guard must clamp the chisel closely, so that the cutting edge cannot be forced against the guard under ordinary conditions.—H. A. Trester, Milwaukee, Wis.



Air-Bellows Device Protects Sand-Blast Operators

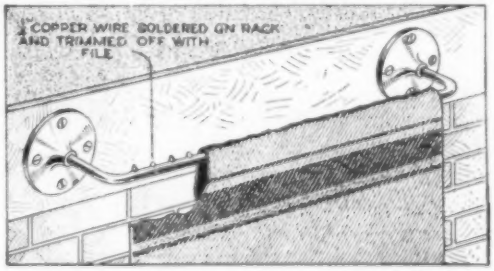
One of the most effective as well as easily contrived devices for protecting sand-blast workers from breathing sand-laden air, is the hoop and bellows combination illustrated. It is very light, being made of heavy muslin, or other close-woven cloth. The hoops are made of light reeds, and the first eight of them are hung by means of rings to an overhead bar so that they can be drawn back and forth. There should be sufficient slack to enable the workman to move freely. A glass window is fitted into a light steel frame through which the operator is able to observe his work. The lower section is provided with a draw string which is pulled up until the cloth fits snugly about the neck. Thus equipped one is fully protected against the sand, and breathes only the air that is brought in from the outside.—Alfred J. Bell, Detroit, Mich.



The Cloth Bellows Protects the Sand-Blast Operator and Gives Him Ample Freedom of Movement

Towel-Rack Improvement Keeps Articles in Place

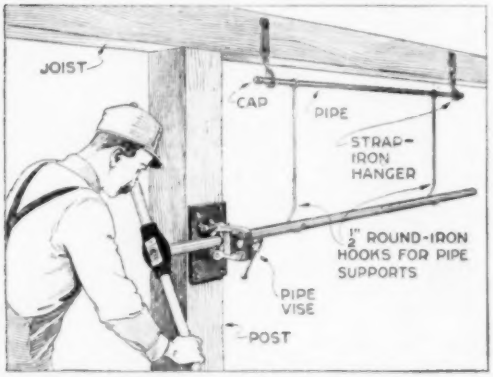
An ordinary metal towel rack is usually a source of annoyance because the towels slip off onto the floor unless carefully hung or the ends balanced. This difficulty may be overcome by soldering a row of copper studs along the top of the rail, as illustrated. A piece of heavy wire should be used. It is first soldered to the rail and then snipped off to ¼-in. lengths. A file is used to dress the points off slightly. If the studs are placed about 1 in. apart over the length of the rail, every towel will remain in the exact position in which it is hung. A coat of nickel-plate will improve its appearance.



A Row of Studs Soldered along the Top of the Rack Prevents the Towels from Slipping Off

Hook Supports for Threading and Fitting Long Pipes

Plumbers and steamfitters frequently experience difficulty when working on long lengths of pipe because of the



The End of a Long Pipe is Supported by the Hooks When the Other End is Placed in the Pipe Vise for Threading or Fitting

tendency of the long end to sag and strain the pipe vise. By providing a set of hooks, as shown in the illustration, the longest pipe may be held in the vise in an absolutely horizontal position. It will be noted that these hooks are swung on a length of pipe which is held in two straps of iron bolted overhead. Ordinary pipe caps are fitted to the ends of the supporting pipe to retain it in its fastenings. This device is invaluable for shop use, and it is not so bulky but that it may be thrown into the truck or wagon and moved from job to job.—Ross A. Williamson, Memphis, Tenn.

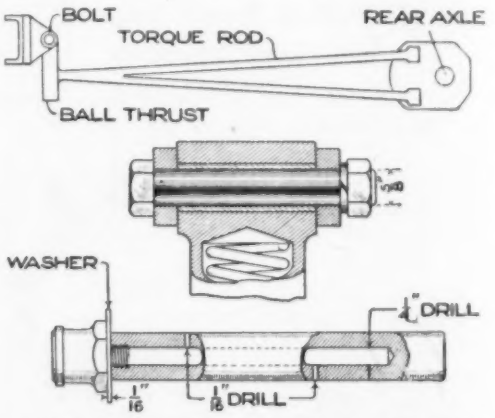
Preventing Casehardening in Dressing Circular Saws

In a small establishment, when hand-filed woodworking saws were sent out to be gummed on an emery wheel, they came back so casehardened as to be very difficult to file at first. Finally a saw sharpener was found, who gummed them without the casehardening. His method was to go around the saw in the usual manner, then go around again once or twice, just touching each tooth enough to remove the outer surface, but not enough to leave a heated surface. In finishing, he imitated the action of high-class automatic filing machines, and no casehardened surface remained on the finished saw.—J. E. McCormack, Haliburton, Ont., Canada.

Lubricating Bolt of a Ball Thrust on a Torque Rod

The bolt carrying the ball thrust of the torque rod on my automobile had no lubricating means provided, so the thrust housing was continually jammed, and consequently could not move when the rod gave under the load. I decided to make this bolt self-lubricating and did so in the following manner:

The head of the bolt was first cut off, after which a deep ¼-in. hole was drilled into the bolt, as shown. Two small 1/16-in. holes were next drilled at right angles to the large hole. The grease-cup head of an old spring-shackle bolt was fastened to the headless bolt, and a 1/16-in. steel washer placed next to it. Ordinary white lead was smeared over the threaded projection of the grease cup to insure a permanent fit. A constant flow of grease



Applying a Grease Cup to a Bolt on the Torque-Rod Ball Thrust of an Automobile

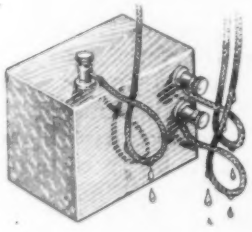
was provided to the bearing and all the trouble eliminated. The resulting decrease in wear was also appreciable.—L. Kline, Chicago, Ill.

Etching a Hole through Hardened Steel

When it is desired to cut a hole through hardened steel, which turns the edge of ordinary tools, a good substitute is to etch the hole through. Cover the steel with melted beeswax; when thoroughly coated and cold, make a hole in the wax with a fine-pointed needle, or other tool, the size of the hole required. Put strong nitric acid upon it; after an hour rinse it and apply more acid, repeating the process until the hole is cut as desired.—William A. Lorence, Richmond Hill, N. Y.

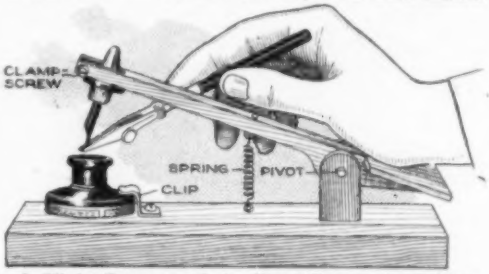
Method of Protecting Terminals from Moisture

Where electric wires are exposed to the weather and run downward to a transformer, or other instrument, trouble is frequently experienced, because the water that runs down the wire seeps in at the terminals, causing short circuits and other damage. This may be prevented by making a loop in the wires as shown in the sketch. The moisture will then run down the wire and drip off at the base of the loop. Motorists whose cars are in use in all weather will find this a useful kink if applied to spark-plug wires that are in the habit of giving trouble.



Ink-Bottle Stopper Lifter Saves Draftsman's Time

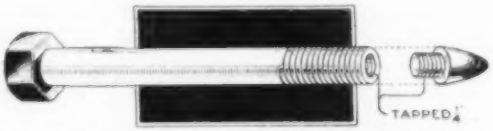
India ink dries so rapidly that, if the bottle is not kept corked between dippings, the ink quickly becomes cloudy and useless. I have overcome this difficulty and am saved the annoyance of removing the stopper for every inking of the pen by contriving an inkwell, as indicated in the illustration. The device is made almost entirely of hard wood, and the few metal fittings it contains are obtainable in any shop scrap heap. With it the ink is protected from the air at all times, and one hand only is required for inking the pen.—George A. Luers, Washington, D. C.



A Slight Pressure of the Hand Brings the Inking Quill into Position

Conical Points for Engine Bolts Simplify Motorcycle Repairs

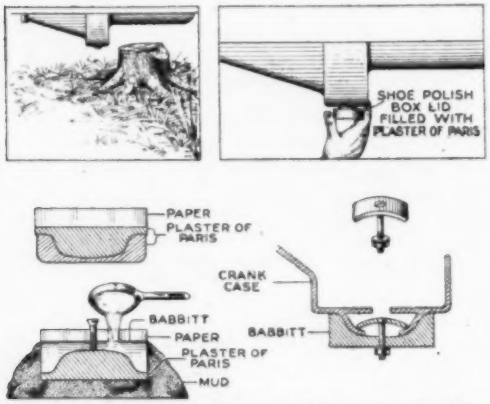
After a motorcycle engine has been removed from the frame there is difficulty in replacing it because the crankcase bolt holes do not line up with the holes in the lugs of the frame. This is avoided and much valuable time saved by fitting the engine bolts with a removable conical head, as illustrated. A hole is drilled in the end of each bolt to a depth of ¼ in., and is threaded with a female thread. The conical head is then turned on the lathe and provided with a male thread to fit into the socket of the threaded end of the bolt. The base of the conical head, being exactly the same size as the body of the bolt, is attached and driven through the parts without the slightest danger of the external threads of the bolt being injured. When the bolt is pounded through as far as it will go the head is removed and attached to the next bolt.—J. A., London, England.



The Conical Steel Head Attached to the Engine Bolts Enables the Motorcycle Repairman to Fasten a Motor in the Frame Regardless of the Alinement of the Bolt Holes

Repair for Plug Broken from Auto Crank Case

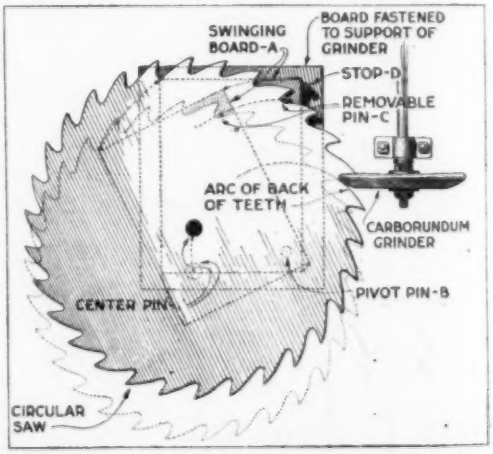
While touring over some rough country I struck a stump, as illustrated in the upper left-hand sketch, which tore the drain plug and its seat from the base of the crank case. A jagged and apparently irreparable hole was left. After being towed home, I succeeded in making the repair indicated in the sketches. A shoe-polish box was filled with plaster of Paris and pushed up against the case, as shown. When the plaster of Paris had set it was removed. This gave me a perfect form of the hole. The surface of the plaster form was then oiled, a paper mold made around it, and filled with soft plaster. When this plaster had set, the two forms were separated and the last-made one was used as bottom for a mold to pour molten babbitt into as illustrated. A suitable bolt and crossbar, as shown, were first placed in the mold. The finished product was a perfectly shaped cover which, by means of the bolt and crossbar, was fastened securely over the hole. Shellac was applied to the surfaces to form a packing. The repair was thoroughly successful and in the several months that it has been in use it has not let a drop of oil escape. The plug is readily removable for draining the motor.—D. W. S. Hutton, Fornfelt, Missouri.



Molds of Plaster of Paris and Paper were Used to Cast a Babbitt Cover which was Bolted in Place Where the Crank-Case Plug had been Torn Out

A Circular-Saw Gummer Made in the Home Shop

When the teeth of the circular saws used in our shop became uneven we formerly sent the saws out to be gummed. This occasioned great delay and inconvenience. To overcome this difficulty and enable us to repair our own saws we put a plain board on a support at the carborundum-wheel stand, as illustrated. On this board was placed another loose board, A, which swung on a small pin, B, as a center. This pin acted as a center of the circle which forms the back side of the tooth to be ground. A second loose pin, C, was placed in the board between two teeth, to hold the saw in the correct position while the tooth was being ground. A third pin, D, was placed to govern the depth of the gullet by acting as a stop when the board A is swung around. By using the commercial wheel made for the purpose and pushing the loose board A slowly toward the wheel until stopped by the pin D, each tooth was ground to the proper shape on the back, straight on the front, and to the correct depth. The pin C was removed in order to bring each tooth into grinding position. The entire saw was thus gummed with absolute accuracy.—Arthur A. Richardson, Center Barnstead, N. H.



With This Tool Circular Saws are Gummed without Removing Them from Their Fastenings

A Scout Monoplane

Built in the Home Workshop

by George D. White

THIS article, the first of four on the subject of airplane building that Popular Mechanics Magazine will publish during the next several months, deals with wing construction. Subsequent chapters will describe the various stages of development with the view of making it possible for men or boys, or groups of boys, of average mechanical ability to construct a successful airplane.—Editor.

Part I—Wing Construction

IN giving instructions for the building of an airplane of any type two prime necessities should be considered: first, the greatest simplicity without weakness, and second, the minimum cost without dangerous cheapness. Several types might be considered, but the monoplane has been selected as the least expensive, simplest, and quickest to build, therefore more suitable for the average builder. Where stock fittings would be too expensive or complicated for the amateur, fittings of original design, but amply strong, have been substituted. The mechanically inclined person can make these for himself. All brazed joints and other complicated constructions have been eliminated, wherever possible without sacrificing strength or efficiency.

If in some of the minor details the usual path of aeronautical construction has been deviated from, it is to simplify, and, therefore, to place the construction within the reach of a greater number of builders. In the most important parts a factor of safety of eight to one has been used. Some scout machines now in use at the battle front have factors of safety as low as three to one. It is hoped that at the conclusion of these articles some of the mystery which surrounds aircraft construction will be dispelled and the amateur will realize that only careful work and patience are needed to construct a thoroughly successful airplane.

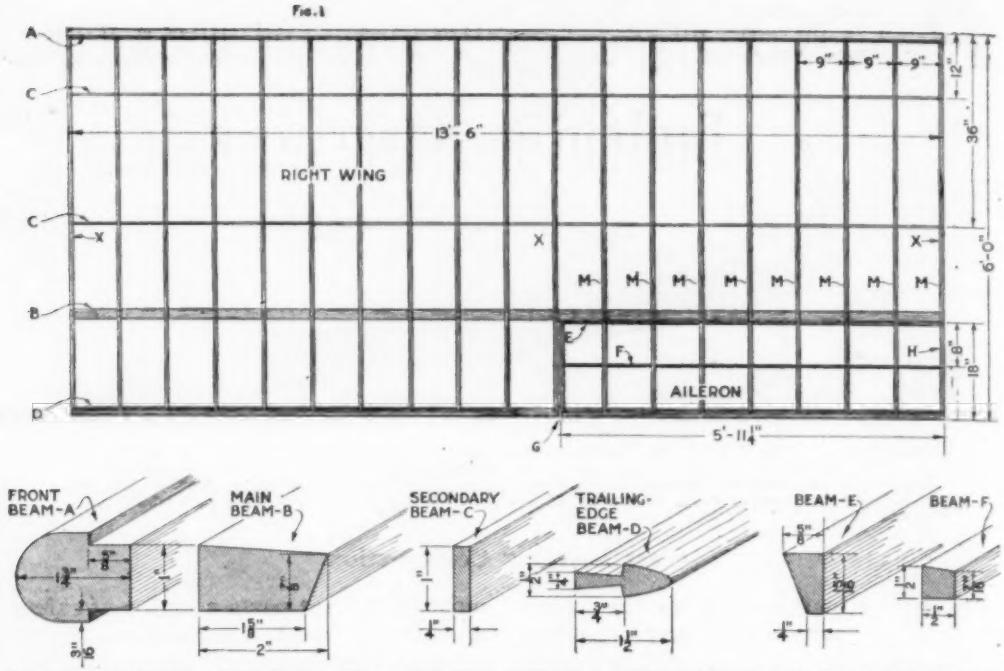
Shop

Before starting to build the machine it is well to provide a suitable shop to house the assembled flier. A shop 25 by 35 ft. will do. This may be a garage, barn, shed, basement, or similar building. No special equipment will be needed, but one should be sure that the doors are large enough to permit the removal of all parts assembled inside. A workbench will be needed and the ordinary tools usually found around the amateur mechanic's bench.

In case of necessity, the plane

DIMENSIONS AND CHARACTERISTICS OF THE PLANE

Length over all	19 ft. 3 in.	Useful load	575 lb.
Spread of wings	29 ft. 6 in.	Motor	35 hp.
Chord of wings	6 ft.	Speed range	30 to 70 m. p. h.
Supporting surface	162 sq. ft.	Control system	Deperdussin



Construction Details of the Wing: There Are Two of These and Either One may be Taken for Right or Left. The Aileron, Which Is a Separate Portion of the Wing, Manipulated While in Flight to Control Lateral Balance, is Sawed Out and Completed After the Wing Frame is Finished

can be assembled in an open field, and then the shop need only be large enough to do the work in and to store the wings, and other parts, while building.

Material

In choosing material great care should be used. The wood should be a good grade of silver, Canadian, or mountain spruce. If no spruce is available, a good grade of white ash can be used successfully. The metal parts should be made of high-grade steel, of the sizes and types specified. It is better to pay a little more for first-class material than to buy a cheaper and poorer grade.

Starting to Build—The Wings

The supporting surface of the monoplane is composed of two wings, a left and right, detail drawings of which are shown in Fig. 1. These wings are each 13 ft. 6 in. in length and have a width, or chord, of 6 feet.

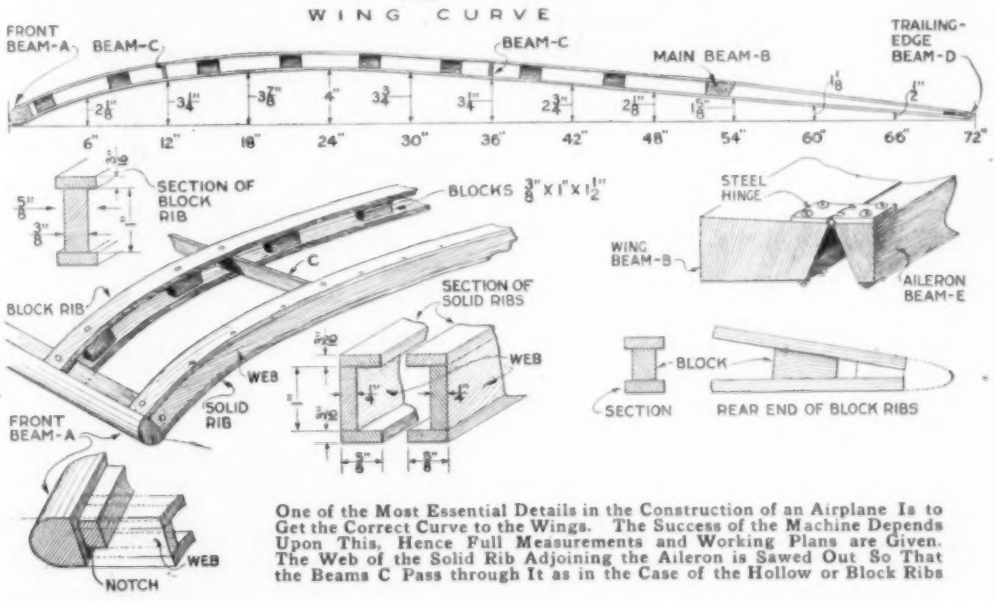
At the outer rear tips are hinged the ailerons, or wing flaps, which are manipulated during flight to retain lateral balance. These ailerons are really a part of the wings, but they are constructed separately and are later attached by means of hinges to the main wing beam.

Each wing is made up of a front beam, A; a main beam, B; a trailing-edge beam, D; two secondary beams, C, and 19 ribs, as illustrated in Fig. 1. The drawing should be studied carefully and constantly referred to while reading the instructions. In this way one will understand the construction step by step.

The ribs for the wings are made first. Nineteen of these are needed for each wing, or 38 for the two wings. Ribs are of two kinds, block ribs and solid ribs, as shown in the detail sketches of Fig. 2. Of the 38 ribs needed, 32 will be block ribs and 6 solid ribs. The block ribs are made from two strips of wood, 3/16 in. thick, 5/8 in. wide, and 6½ ft. long. The wing curve, shown in Fig. 2, should be plotted out actual size on a board and sawed for a pattern. Some blocks, 3/8 in. thick, 1 in. high, and 1½ in. long,

are then cut. To make one block rib, two strips, 3/16 by 5/8 in., 6½ ft. long, and eight blocks are needed. The strips are glued and nailed above and below the blocks with ¾-in. flat-headed wire nails. The first block is glued and nailed 1 in. from one end of the 3/16-in. strip and seven more blocks, at intervals of 6 in., behind it. In nailing up these ribs they should be fastened over the wing-curve pattern which was first sawed out, and when all the blocks are nailed the rib will automatically hold its curve. Cut the ribs off exactly 5 ft. 10⅛ in. long, and 1 in. from the rear where the upper and lower strips come together, a wedge-shaped block is glued and nailed between them, as detailed in Fig. 2. A section of the block rib is also shown in Fig. 2. The solid ribs are made differently. From ¼-in. thick lumber a piece the shape of the wing curve, but 3/16 in. smaller at the top and bottom, is sawed out, so that when a 3/16-in. strip is nailed above and below this, both types of ribs will be the same size. Solid ribs are made left and right. Three of each are needed. After 32 block and six solid ribs have been nailed up, one is ready to begin construction of the wing. Two solid ribs are located at the ends of the wings and one near the middle adjoining the aileron, as indicated by X, Fig. 1. All other wing ribs are of the block type.

Fig. 2

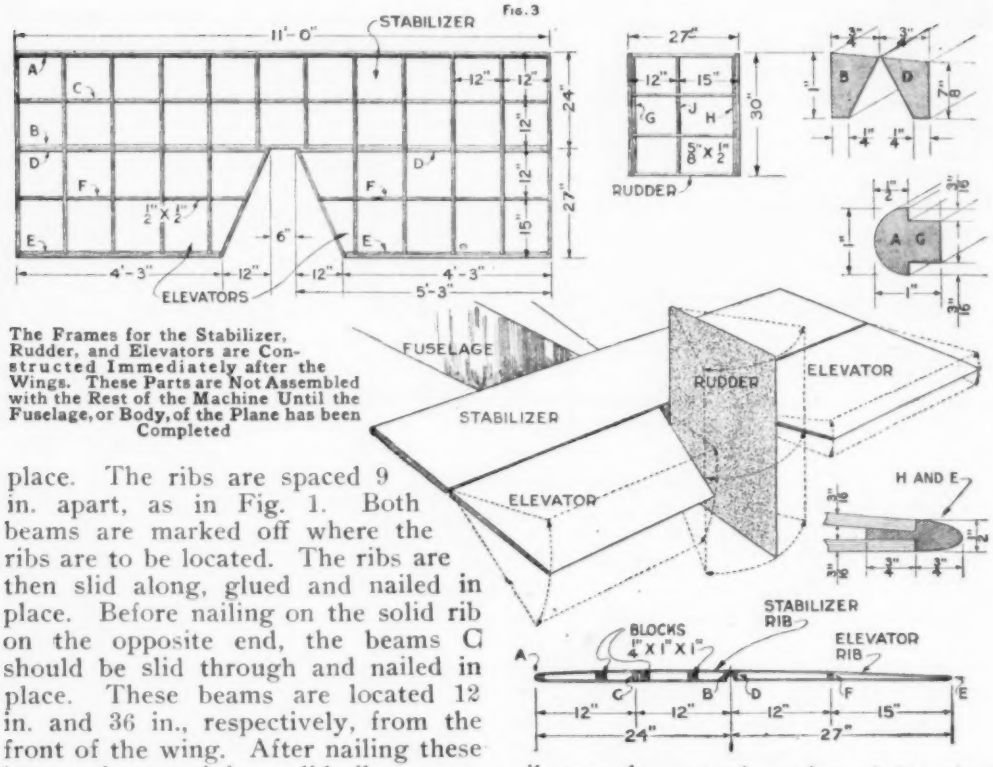


One of the Most Essential Details in the Construction of an Airplane Is to Get the Correct Curve to the Wings. The Success of the Machine Depends Upon This. Hence Full Measurements and Working Plans are Given. The Web of the Solid Rib Adjoining the Aileron is Sawed Out So That the Beams C Pass through It as in the Case of the Hollow or Block Ribs

Assembling the Main Wings

Two beams made like A, B, and D, Fig. 1, and four beams like C, Fig. 1, should be provided. The beams A and D are cut off to exactly 13 ft. 6 in. in length. The beams B and C should be cut off to 13 ft. 5½ in. The materials are now ready for assembling the wings.

The ends of the beams A are notched as shown in the front-beam detail sketch, Fig. 2. This allows the web of the solid ribs to sink in flush with the end of the beam. To assemble the wing, one should start by nailing the beam A to a solid rib. Flat-headed ¾-in. wire nails are driven through the 3/16 by 5/8-in. strip and shingle nails are used through the web of the rib into the end of the beam. All joints should be glued before nailing. Flat-headed wire nails are used where not otherwise prescribed. The main beam is located 18 in. from the rear of the wing. The location is first marked on the rib and the main beam B nailed in



The Frames for the Stabilizer, Rudder, and Elevators are Constructed Immediately after the Wings. These Parts are Not Assembled with the Rest of the Machine Until the Fuselage, or Body, of the Plane has been Completed

place. The ribs are spaced 9 in. apart, as in Fig. 1. Both beams are marked off where the ribs are to be located. The ribs are then slid along, glued and nailed in place. Before nailing on the solid rib on the opposite end, the beams C should be slid through and nailed in place. These beams are located 12 in. and 36 in., respectively, from the front of the wing. After nailing these beams the remaining solid ribs are attached. The beam D is notched the same as the beam A, and nailed in place as the others. The frame of the first wing is now complete and should measure 6 ft. by 13 ft. 6 inches.

The Ailerons

As stated previously, the ailerons are classed as part of the main wings, but they are in reality separate planes and are hinged to the main wing beam. The ailerons are each 18 in. by 5 ft. 11¼ in. Either end of the wing may be considered the outside. On the outside end of the wing the ribs marked M are cut off flush with the rear edge of the beam B. The beam D is cut at G, as indicated in Fig. 1. The section may then be lifted out. Fig. 1 should be carefully studied and will make this explanation clear. A solid rib the shape and size of rib H should be made, and having this section of the wing cut out, the new solid rib and two beams E and F are assembled to compose the aileron. The solid rib near the central portion of the wing reinforces that section of the structure in the vicinity of the trailing edge beam and adjoining the aileron.

The beam E is cut off to the length of 5 ft. 10¾ in. and the beam F the same length. The beam F is located 8 in. from the front of the aileron or 8 in. from the rear edge of the main beam B. When these two beams have been nailed in and the solid rib added in the inside end, the aileron frame is completed. It will be seen that it forms a continuation of the wing when held in place and is ¾ in. shorter than the space left in the wing. This provides for clearance when the aileron is manipulated in flight. It is also apparent that the main wing beam B is beveled at the bottom, and the front aileron beam is beveled at the bottom, as shown in Fig. 2. When the two beams are placed together this forms an inverted "V" between them. This allows the free action of the flap. The aileron will be hinged to the main wing beam with

flat steel hinges after the wings have been covered. After finishing the wing frames they should be sandpapered until all roughness and sharp corners are removed. If not removed these would puncture the wing fabric and result in a general weakening of it.

Stabilizer

The stabilizer, shown in Fig. 3, is a small plane, 2 by 11 ft., located at the rear of the fuselage to which the elevators are hinged. It is composed of a front beam, A, a rear beam, B, and a middle beam, C, and two solid and 10 block ribs. The beam A is cut to the length of 11 ft., beams B and C to the length of 10 ft. 11¾ in. The solid and block ribs are nailed and glued, the ribs being located 12 in. apart. A solid rib is placed on each end. All other ribs are block type. The stabilizer is assembled the same as the wings and ailerons, and then sandpapered smooth.

Elevators

The elevators are two in number and are hinged to the rear of the stabilizer in the same way that the ailerons are hinged to the wings. Each elevator is made up of a front beam, D, a trailing-edge beam, E, and a middle beam, F. A cross section of the elevators is shown in Fig. 3. Each elevator measures 5 ft. 3 in. inside width by 27 in. in depth. The trailing edge is only 4 ft. 3 in., as the side elevators taper, as shown in the drawing, to allow for rudder movement. The elevators are assembled the same as the other planes. No new construction is involved. The trailing-edge beam E is the same size as the wing beam D.

Rudder

The rudder is operated as a boat rudder by swinging sidewise and is composed of a front beam, G, a trailing-edge beam, H, the same size as the wing beam D, Fig. 1, and a third beam, J, located 12 in. from the front. Two solid and two block ribs are used. The rudder is assembled in the usual manner, and is sandpapered after assembling the same as the other parts.

(To be Continued)

Paintbrush for Overhead Work Has Drip Retainer

In overhead work, such as painting ceilings or under parts of woodwork, more or less paint is usually wasted, and is a source of annoyance by running down the brush handle and over one's hand. I have eliminated this by providing my brushes with a light metal drip cup, as shown. After dipping the brush in the paint and taking several strokes it is only necessary to turn the bristles downward for a few seconds to run the paint in the drip cup into position for use.—R. O. Helwig, Chicago, Ill.

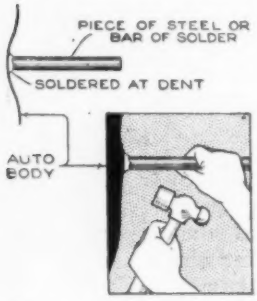
Repair for Worn-Out Shovels and Spades

Shovels and spades are ordinarily discarded whenever they wear until the ends become frayed, even though the handle and a large part of the metal structure is still intact. These worn tools may be reclaimed and made to render indefinite service by notching the points, as shown in the sketch. The repair is best accomplished by placing the blade on an anvil and cutting out the notches with a cold chisel. It should then be placed in the vise and dressed up with a three-cornered rasp.

¶In spraying buildings with paint or whitewash, the windows and doors can be protected handily by light wooden frames covered with building paper.

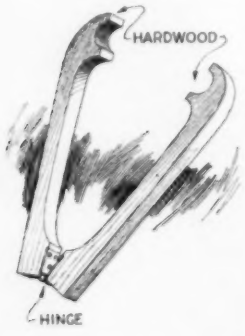
Removing Dents in Auto-Body Panels and in Tanks

Automobile bodies often become dented, and the motorist is at a loss to devise a practical method for removing the dents. One method which has been found useful in such cases, and which the mechanic can also apply in removing dents from tanks, cans, and other sheet-metal constructions, is shown in the sketch. A piece of steel rod, or a bar of solder, is soldered at the dent, as indicated. The dented area is tapped gently with a hammer, and a strong pull is exerted at the same time on the bar. Unless the metal is heavy, the dent can be removed with very little difficulty.—Otto Kraft, Chicago, Ill.



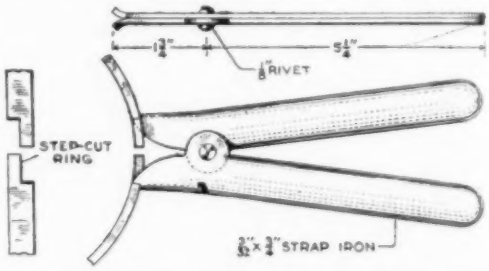
Tool for Removing and Applying Fuse Blocks Safely

To eliminate the danger of removing and applying high-voltage fuse blocks by the conventional plier, or screw driver, method, I have provided myself with a wooden tool, as indicated by the sketch. Hickory, ash, or any other hard wood, is best adapted for the purpose. The notches for getting hold of the block are cut out so they will fit any fuse down to 500 volts. Wrapping the handles with friction tape will also help to insure the user against possible shocks.—P. E. Ridings, Tarkio, Mont.



Tool for Removing Step-Cut Piston Rings

Step-cut piston rings may be removed quickly, and with little danger of breaking them, by the use of the expanding tool illustrated. Pressure exerted on the handles forces the jaws outward, and when the nose of the tool is pressed into the steps of the ring the desired result is accomplished. In using the tool one should provide himself with four strips of heavy-gauge tin, or copper, about ½ in. in width and the height of the piston in length. As the ring is expanded, these are worked under and around the piston. After two strips have been placed under the ends of the ring and the other two worked around to equidistant points on the piston, the ring may be slipped off over the piston head without further difficulty.



The Jaws of This Tool Work Like Those of a Curling Iron, and When Inserted in the Steps of a Piston Ring Expand It to Permit Quick Removal

Concrete Flywheels for Light Foot-Power Machinery

Concrete flywheels for many varieties of light machinery are quite as satisfactory as cast wheels costing from 15 to 20 times as much.

The thickness of the wheel is determined by the width of the belt to be used, and the diameter by the speed that is to be given to the driven pulley. A cheese box may be used as a mold if it happens to be of the desired size, or any thin wood may be bent to the correct form and fastened to a board with triangular brackets nailed to the outside. The greatest care must be

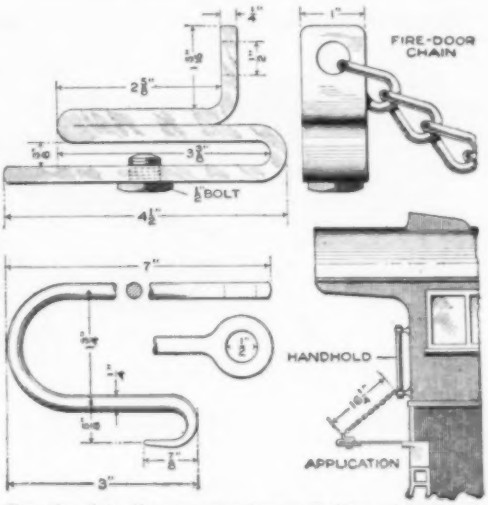
taken to have the circle as near perfect as possible; otherwise the wheel will not run true. The mixture used should be one part Portland cement to five parts of clean, fine sand.

The wheel should be cast around the shaft upon which it is to be used, and great care must be used to have the shaft exactly in the center when the concrete is poured. Two holes are drilled in the shaft about a quarter of an inch apart and at right angles with each other, into which are driven steel rods, about 8 in. in length. These rods will be gripped by the concrete and hold the wheel and shaft together as if they were one piece. This is important, inasmuch as there is a heavy strain on the wheel, and a breaking flywheel is as dangerous as an exploding gun barrel.

Care must also be used to set the shaft square with the face of the wheel so that it will run true. A square with a long blade should be applied all around the shaft, and the shaft shifted until it is as accurately placed as possible. No matter how carefully the mold has been set for the outer edge, it should be gauged as to its distance from the shaft when the latter has been set. If the shaft is out of center, the wheel will wobble, causing violent vibration. After being completed and set in place, the surface of the wheel can be greatly improved by the application of a coat of good belt dressing, rubbed well into the pores and the surplus removed. — Kinsley Greene, Cliffside, N. J.

Locomotive-Apron Holder Aids Quick Coupling

Delays and inconvenience are frequently caused in coupling and uncoupling locomotives to and from the tender because the apron drops down below its horizontal position. This may be prevented by the installation of the holding device shown in the sketch. It consists of two clamps of the size and shape illustrated. Each clamp has a setscrew for tightening it on the apron for safety. Attached to the clamps are 16¼-in. lengths of 5/32-in. chain, which hook at the other end to the cab handholds. The parts are

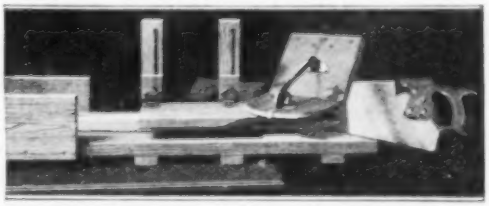


Details of the Locomotive-Apron Holder with Sketch Showing the Manner in Which It Supports the Heavy Part While the Engine is being Coupled or Uncoupled

inexpensive to make, and besides saving much time and aggravation, will prevent many injuries to fingers.

Wooden Miter Box with Many Uses

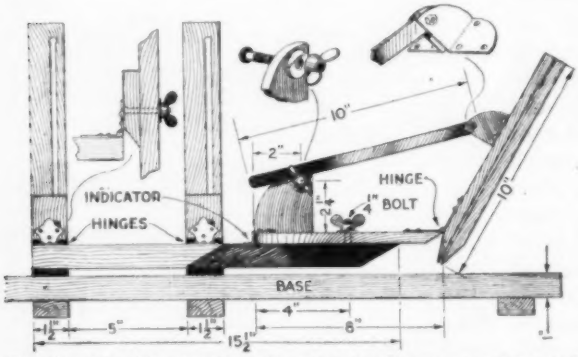
Handling a considerable amount of mitered work, with double angles and odd joints, made necessary a miter box in which these various cuts could be made readily. In working out this problem the result was a homemade wooden miter box, which does every service of an ordinary, expensive metal and wood machine, and much other



View of the Miter Box in Use, Showing the Adjustable Guide and the Slotted Uprights

work not possible on the usual type of miter box. It was built largely of wood, as shown in the photographs, and detailed in the working drawing. The base was made of 1-in. hard wood, sup-

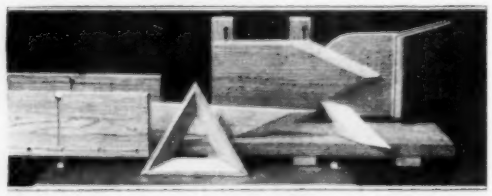
ported on cleats. At the back of the base are mounted two vertical supports, slotted to receive the sliding pieces which are hinged to the piece that covers the work being sawed. The



Details of the Construction, Showing the Clamping and Pivotal Features of the Saw Guide and Gauge

work is placed on the base, back against the uprights, and the cover piece, which supports the adjustable gauge and guide, is placed over it, the proper adjustment being made at the wing nuts on the uprights.

Adjustment for the various angles on the horizontal surface is made by pivoting the saw guide around its center, and clamping it at the wing nut. The adjustment for angles of cut from the vertical is made by means of the hinged saw guide and the clamping bar at the back of the guide. This bar is made of a strip of iron, pivoted at its upper end between two galvanized-iron angles. Its lower end rests on a washer cut to receive it, as detailed, and is clamped firmly by means of the wing nut. The range of adjustment, as is evident from the detailed drawing, covers a wide angle, and can even be extended by enlarging some of the parts.



Under View of the Cover Piece and the Guide, and Specimen Cuts

Testing Knife-Switch Contact Blades

It is important that knife-switch blades, especially the large ones, should make good contact in the jaws. A poor contact will cause the switch to heat and produce corrosion that will eventually destroy the blade. Any thin, hard material may be used for making a "feeler," by the use of which one may determine the condition of a contact. A piece of mica, 3/8 in. wide and .003 in. thick, or a piece of sheet steel of the same dimensions, is satisfactory. To use this tool it is inserted between the jaw and switch blade at different points. If it can be pushed in readily the contact is poor. This may be corrected by light hammer blows on the sides of the jaws. This repair is only temporary. To make a perfect contact, the switch should be ground in with vaseline and fine pumice.—R. L. Berge, St. Louis, Missouri.

Balancing Rotating Machine Parts by Drilling

In spite of careful machine work, rotors made in a shop where there was no machine for balancing machine parts precisely were found to be slightly out of balance. This was remedied by mounting the rotors on a pair of parallels, having knife-edges. After the light side had been determined, a small hole was drilled in it, and a pin inserted. Washers were put on the pins until a balance resulted. The amount of metal to be removed from the opposite side by drilling small holes was thus determined accurately, and the exact point at which this could be done handily was also found.—Clarence Anderson, Worcester, Mass.

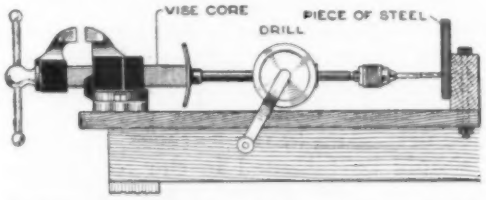
¶Where numerous nuts are used on a machine, it is desirable to have them fitted by a single wrench, or at least that they are of standard sizes.

Lead Mallet Head Cast Securely on Pipe Handle

Most machine shops have use for a babbitt, or lead, mallet, which may be used on polished metal parts. A good form of such a mallet is that having the head cast around a pipe handle, the end of the pipe being spread to lock it in the lead. A pattern for the head is made of wood, on a lathe. A suitable length of 1-in. diameter gas pipe serves as a handle. A mold for the head is made in sand, in the usual manner, and the pipe placed in position, in the mold. The metal is then poured in, imbedding the handle firmly.

A Vise and Breast Drill Used as a Substitute Drill Press

Having to drill a number of holes in pieces of ½-in. steel with no drill

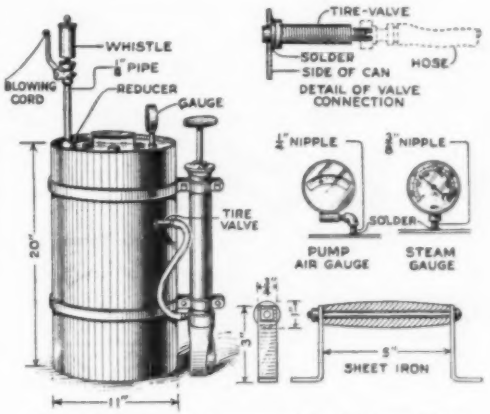


By Combining the Vise and Breast Drill, the Action of a Horizontal Boring Machine was Secured

press available, the work was tedious. The necessity of bearing heavily against the brace of a breast drill made frequent rests unavoidable. To overcome the difficulty, a block of wood was bolted to the bench, 18 in. from the vise, which happened to be of the swivel type. The piece of steel to be drilled was then brought into place in front of this. The point of the drill was properly centered and its arm brace at the other end was placed against the moving core of the vise, as shown in the sketch. By turning the drill with the right hand and tightening the vise with the left as the drill penetrated the steel, a constant pressure was easily maintained. The holes were drilled rapidly and with comparatively little labor.—Russell Wilson, Detroit, Mich.

Loud-Sounding Air Whistle for Camp or Motorboat

At slight expense and with little work a portable air whistle, suitable

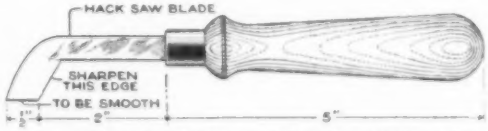


Showing Details of Construction of Siren Made of Kerosene Drum, Tire Pump and Gauge, and Brass Whistle

for installation in a motorboat, and for various other purposes, may be made by using a kerosene drum as a pressure tank. An ordinary foot pump is clamped to the cylinder with iron straps, and a tire valve soldered in a hole drilled near by. A pressure gauge of some kind and a brass whistle, 3 in. long, are soldered in the top of the can.—P. P. Avery, Garfield, N. J.

Old Hacksaw Blades Converted into Electricians' Knives

Knives of a type suitable for many uses in electrical work, and especially for trimming core cells, may be made by grinding old hacksaw blades and providing them with a handle, as illustrated. Blades of 1-in. width prove the most practical. A file holder makes the best handle, but a corncob will

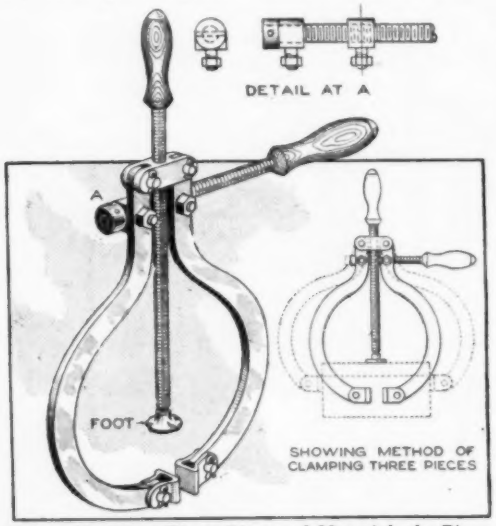


For Scraping Insulation, and for Many Other Electrical Uses, Hacksaw-Blade Knives Are Useful

serve the purpose quite well.—R. R. Dilenschneider, Fremont, Ohio.

Three-Way Hand Clamp Has Many Uses

Where three pieces of material must be clamped together at the ends, as is frequently necessary in pattern making, a three-way clamp, as illustrated, is a most convenient tool. Such a clamp is not difficult to make if one is able to obtain two old single-screw clamps which may be dismantled to secure the desired screws. The arms are of cold-rolled stock, while the fittings may be of any grade of steel soft enough to be readily worked. The joint A is the most difficult part to make, hence for the sake of clearness, a detail of it is shown in the sketch. No dimensions are given, as these must be determined by one's requirements.



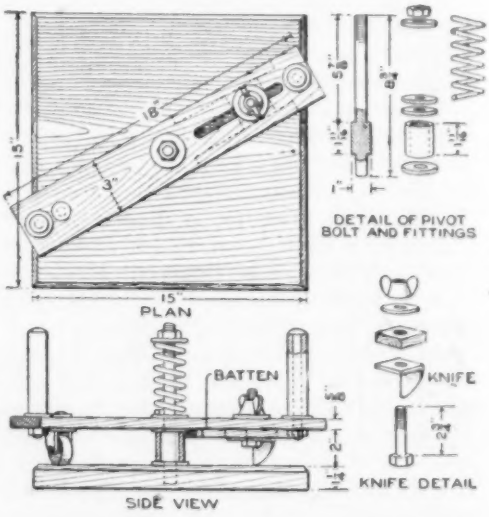
When Clamping Three Pieces of Material, the Piece in the Middle is Prevented from Sliding Out by the Adjustment of the Central Screw

Novel Method of Machining Slot in Hard Casting

It was found necessary, in a shop having rather limited facilities, to cut a slot in an unusually hard casting. A novel method was employed with satisfactory results. A hole was burned in the casting by means of an oxygen torch. The hole was filled with molten brass, and the slot machined readily in this metal.

Homemade Machine for Cutting Washers and Packings

The machine illustrated enables anyone to cut large pump washers and packing gaskets accurately. It is especially useful to plumbers and steam fitters. The knife is fastened on an arm which rotates on a pivot while held down against the baseboard by a spring and with the opposite end supported by an ordinary caster. The base is of hard wood and its edges are beveled. The knife fastenings are located in a slot to permit adjustment for cutting various sizes of washers. The mounting and operation of the knife are shown in the detail. In cutting a piece of leather, or packing material, it is first punched with a ¼-in. hole. The knife and fastenings are removed and the stock is placed over the bolt. Several thumb tacks are used to hold it in place. After being replaced the knife is adjusted to the distance that will give the desired size and the handles are rotated from left to right. The washer will be cut in a smooth, true circle. Considerable pressure may be needed on heavy leather. The knife should be fastened in the block so as to be readily removable for sharpening. —L. B. Robbins, Harwich, Mass.



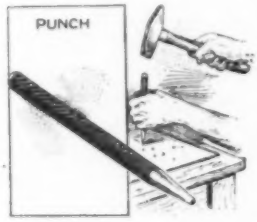
Construction Details of the Washer and Gasket-Cutting Machine Which Cuts These Parts Quickly and with Absolute Accuracy

Washing Off Pencil Tracings after Blueprinting Saves Cloth

A goodly saving in drafting supplies may be effected by making drawings of a temporary nature, such as foundation plans, bills of material, preliminary surveys, etc., on tracing cloth with a soft pencil. After the required number of blueprints have been made, the drawing is washed off the cloth entirely with gasoline, and as soon as it is dry, this taking only a few minutes, the cloth is ready for the next drawing. A piece of tracing cloth used in this manner, if carefully handled, is good for 15 or 20 drawings. Use a soft rag or piece of cotton waste to apply the gasoline.—Roy H. Poston, Flat River, Mo.

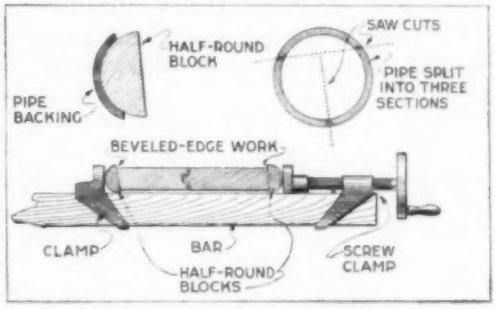
Center Punches Made from Old Rat-Tail Files

Serviceable center punches may be made from worn-out and discarded rat-tail files by grinding off the ends and shaping them on an emery wheel. After being ground, the upper end should be softened slightly by heating to a dull red and allowing it to cool slowly. The intermediate file surface should not be removed, inasmuch as it aids the workman in holding the punch.



Half-Round Blocks Aid in Clamping Beveled-End Work

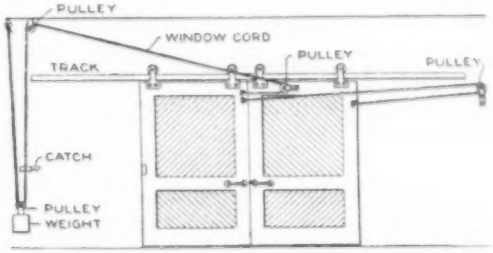
A few short pieces of half-round hard wood of various sizes are useful for beveled-end clamping operations, as indicated in the sketch. They may be used in connection with all work where the bevel is slight. These blocks are also useful in cases where wide work has to be clamped under heavy pressure and the bar is sprung. The half-round blocks automatically adjust themselves to the deviation and transmit the pressure uniformly. Where a great deal of such clamping is done, or the work is heavy, it is often desirable to make half-round blocks with a steel back. These may be formed by splitting a short piece of pipe into three sections and gluing a piece of half-round block into each section. Convenient lengths for these blocks are 3, 4, and 6 in. The pipe backs should be about an inch shorter than these lengths.



The Blocks of Half-Round Hard Wood Make Beveled-End Work Easy to Clamp

Pulley Arrangement Is Helpful in Operating Double Doors

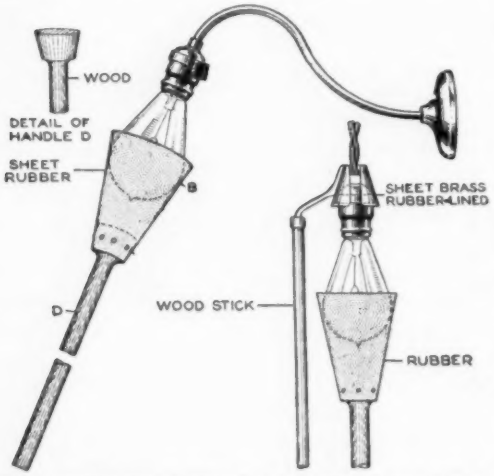
To keep the sliding double doors of a garage, or barn, tightly closed and also to enable a person to open both of them simultaneously, the pulley-and-weight system explained by the drawing has been found satisfactory. When wishing to enter or leave the building without opening both doors, the one at the right should be used, for it slides easily and does not actuate its companion.—Robert L. Cook, Madisonville, Ky.



By the Use of Pulleys and Weights Both Doors are Opened or Closed Simultaneously and with Little Effort

Tools for Handling Electric Globes without a Ladder

In removing or installing electric globes, ladders cannot be used sometimes because immovable objects on the floor happen to be in the way. Ladders at best are dangerous, and their use should be avoided if possible. The long-handled tools illustrated are easily made and eliminate much of the climbing. The handle D may be made from any hard wood and of the length required. It is shaped at one end as shown in the detail sketch. The funnel B, which engages the globe when the tool is in operation, is made from any heavy sheet rubber. With these tools globes high up, or on a drop cord, may be removed or replaced with little exertion and with the usual dangers of such work wholly lacking.—I. C. McDonnell, Toronto, Ontario, Canada.



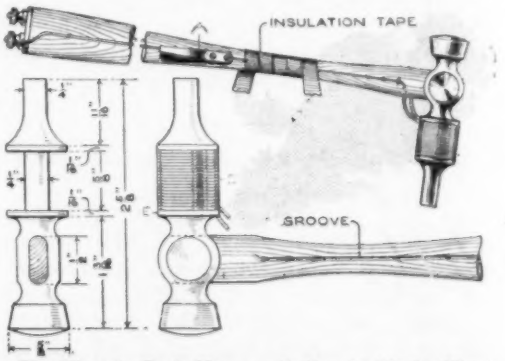
The Funnel-Shaped Rubber Cup Mounted on a Long Handle Serves to Manipulate Electric Globes in High Places without the Use of a Ladder. The Other Tool is Used to Hold a Drop-Cord Fixture While a Globe is being Removed or Replaced

Broken Slate Instrument Panel Repaired with Angle Iron

After an expensive slate instrument panel had been drilled for a large number of instruments, thus adding to its original cost, the panel was accidentally thrown to the floor, breaking across the middle. A satisfactory repair was made by bolting angle irons the full length of the panel and across the break. This made the panel as strong and serviceable as if unbroken. After the crack had been filled and polished over, the break was hardly noticeable.

Magnetic Tack Hammer Is Electrically Operated

Experiencing difficulty in driving small tacks with an ordinary magnetized hammer because it would always pick up several tacks when placed among them, I constructed the electrically operated hammer illustrated. I first procured a piece of soft steel and turned it as shown in the diagram. Two holes were drilled in the flange E, large enough to admit a No. 24 gauge magnet wire, and the magnet was then wound. Two slots were cut in the handle to accommodate the wires leading from the binding posts, placed in the end of the handle, to the magnet coil. I used a 2-in. length of brass spring stock to form the switch A. This was attached to the handle by small screws. The handle and magnet coil of the finished hammer were wound with insulating tape and given a coat of shellac. Two dry cells and a length of flexible cord supply the current, which may be applied or broken as desired by the use of the switch.—Marion J. Teachout, Martville, N. Y.



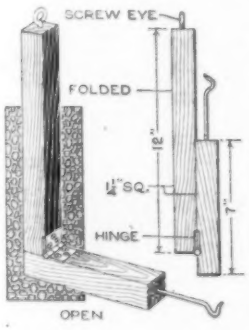
The Electric Tack Hammer Is Invaluable for Many Uses Because It may be Instantly Magnetized or Demagnetized as Desired

Rubber Hose Stops Rattling of Automobile Hood

Many automobile hoods, when they become old, rattle in spite of secure clamping. A good method to remedy this nuisance is to fit the lower edges of the sides of the hood with ordinary rubber gas hose. A section of hose, the length of the hood, is split and slipped over the edge of the side panel. The usual clamps are set into place, and the panel clamped down over the hose. In spite of the jarring, the hose stops the noise.

Suspension Heating Device for Small Utensils

When heating material in any small utensil over a Bunsen flame, or gas plate, one is frequently confronted with the problem of placing the vessel in such a position that maximum absorption of heat will be obtained. This problem was solved by constructing a small folding wooden bracket, which may be hung at the back of the bench from any of a row of nails at various elevations. When not in use the bracket folds, as indicated.



Cleaning Files with Block of Wood

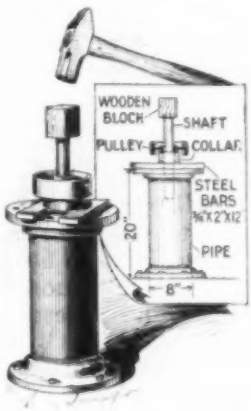
Where a file-cleaning brush is not at hand—and it seldom is at hand when wanted—a quick and effective way to clean files is by rubbing them in the direction of the cut with the end-grain edge of a block of soft wood. The fibers of the wood, at the sharp corner, are pressed into the file cuts and clean out the dirt and particles of metal. The wooden block even removes grease and oil, which a much-used file brush will not ordinarily do.

Wire Soldered over Mouth of Pail Saves Paint

The usual method of removing superfluous paint from the brush is to draw it over the edge of the container. This occasions the loss of paint, inasmuch as some of it always runs down the outside of the bucket. If a piece of wire is stretched across the mouth of the pail and soldered in place, as shown, the brush may be drawn over it to remove all but the suitable amount of paint. The superfluous material falls into the bucket, and the edges and outside of the container are always clean.

Block for Driving Mandrels and Similar Machine Parts

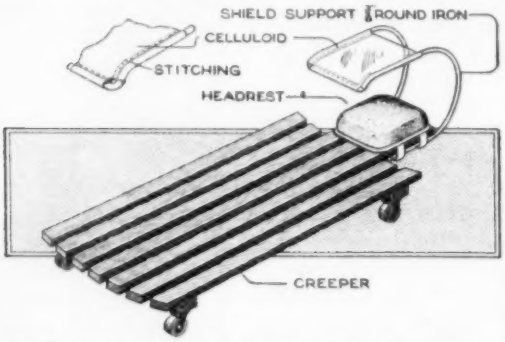
Many shops are unprovided with a block for driving mandrels, or other machine parts requiring a driven fit, and in consequence workmen are embarrassed, and much valuable time is lost on the occasional jobs of this sort that arise. By fitting machined collars on the ends of a piece of heavy iron pipe and bolting its lower end to the floor, a driving block, as illustrated, may be quickly contrived in any shop. Two steel bars, 12 in. long, 2 in. wide, and ¾ in. thick, should be provided for use as rests under small work. A soft hammer, or a block of hard wood, should be used on jobs where there would be danger of swell-



ing the end of the shaft. The diameter of the opening in the end of the driving block should be large enough to insert the hand if parts are dropped inside.

Shield on Creeper Protects Face When Working under Auto

To protect one's face when working beneath a motor car, a transparent

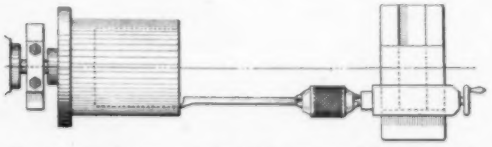


The Frame, Made by Bending an Iron Rod, Supports a Celluloid Shield above the Headrest of the Creeper

shield may be provided above the headrest of a creeper by attaching a sheet of celluloid to an iron frame. The support is made by bending a rod and clamping its free ends to extended slats. The celluloid should be sewed to strips of canvas bound around the rod.

Pattern Maker's Boring Tool for Small, Deep Work

When a pattern maker has small, accurate pieces of work calling for the boring of deep holes of small diameter, it is usually more or less difficult because the necessary tools are not at

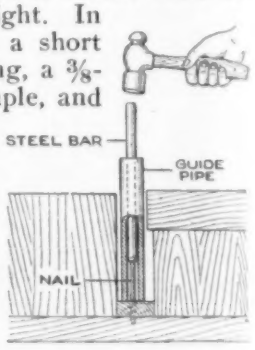


For Deep, Accurate Work in Pattern Making This Lathe Cutting Tool in Many Instances Fulfills All Requirements

hand. Most pattern shops are provided with a lathe having a tailstock that may be shifted to the right or left of the lathe bed. By providing a tool as illustrated, and placing it in the drill stock, small, deep, and accurate work may be accomplished. The tool is made from a piece of ⅜-in. tool steel. It is heated and hammered flat, then ground and retempered. When held in the tailstock it will cut a ¼-in. hole, which may be enlarged to any desired size by shifting the position of the tool. Several such tools when made up in different sizes will enable one to meet almost every requirement of deep cutting work.

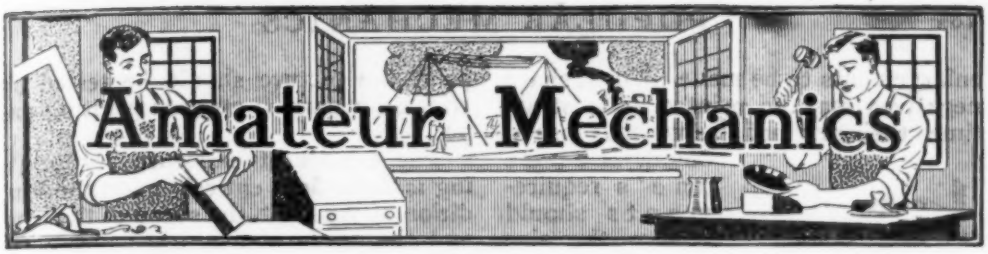
Gas Pipe Guides Nails Driven in Close Quarters

In millwrighting, as in general building-repair work, it is sometimes necessary to drive nails in cramped places where they cannot readily be held with the hand to insure their being driven straight. In such cases, take a short piece of gas piping, a ⅜-in. size, for example, and get a slightly longer length of steel, or iron, rod that will slip loosely into the piping. Then drop the nail into the pipe, sliding the rod behind it, and use the pipe to guide the nail while hammering on the end of the rod, as shown.



Mending Torn Tracings

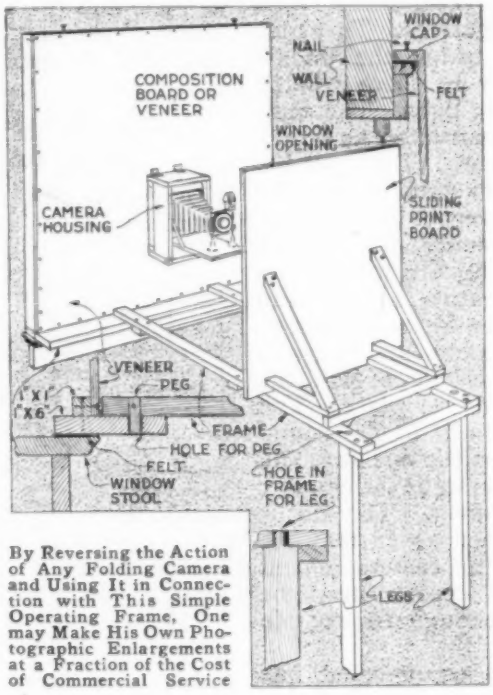
Tracings that have become worn, frayed by use, or torn, may be mended, without destroying their usefulness in making legible prints, by pasting a piece of unused tracing cloth, or tracing paper, at the damaged place. The patch should be pasted on the dull side of the tracing cloth, with library paste. The weave of the tracing-cloth patch should be set to correspond with the weave of the tracing, or serious buckling may result at the patched part of the drawing.



Photographs Enlarged with Any Folding Camera

By ROY LAMONT

AMONG the thousands of amateur photographers who do their own developing, there are many who would also do their own enlarging if they but knew what a simple and really inexpensive process it is. By constructing the necessary frames and reversing the action of an ordinary folding camera, as illustrated, thoroughly satisfactory results are obtainable. A room on the north side of the house is the best place to work, as it is more easily darkened. It is possible to use any other room, but operations must then be timed so that the window used will be in the shade.

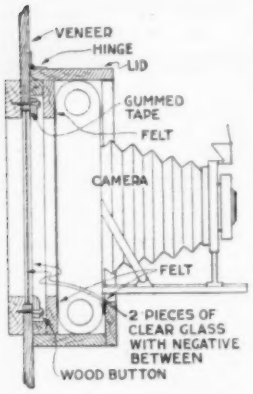


By Reversing the Action of Any Folding Camera and Using It in Connection with This Simple Operating Frame, One may Make His Own Photographic Enlargements at a Fraction of the Cost of Commercial Service

Referring to the sketches, a frame of 1 by 3-in. material, to fit closely about the window casing on the sides and top, is made. The bottom frame board is a piece of 1 by 6-in. material and is supported by the window sill. The entire frame is then covered with composition board, or veneer, as illustrated. Such veneer is usually obtainable from old packing cases, especially those of the type used for shipping phonographs. A coat of heavy wrapping paper is pasted on both sides of the veneer panel to insure its being thoroughly light-proof. Felt, which may be cut from an old hat, is cut in ½-in strips and tacked over the edges to further exclude any possible rays of light. A hole through the top of the frame and into the window casing receives a couple of 10-penny nails. This holds the top securely. The bottom should fit tightly enough to stay in place without further fastening, but a nail may be driven into it, if there is any tendency to spring out and admit the light.

The printing frame is made of 1 by 3-in. material, and is 6 ft. long and 20 in. wide. It is held together with pegs, as shown in the detail, and is supported by two legs just long enough to raise the ends of the frame into a horizontal position. The printing board is a part of a separate frame, which slides back and forth on the horizontal structure. It is notched between the two parallel frame bars to prevent side motion. To this board the printing paper is pinned, therefore its dimensions should be slightly greater than the maximum dimensions of the

enlargements to be made. Good, sharp negatives may be printed at least six times their original size without loss of detail. Hence one's requirements should govern the size of the printing board.



Next comes the camera. A negative is best enlarged through the same lens with which it was made. A hole is cut through the veneer, ½ in. larger each way than the size of one's negatives. This hole should come well below the middle sash of the window so there will be no obstruction of the light. The camera frame is then constructed, as shown in the detail sketch. The outside frame should be ⅛ in. smaller than the negative. Two pieces of clear glass, to fit the larger opening, are cut and bound together along one edge. Between these the negative is held as in a book. Two wooden buttons, as indicated in the illustration, are fastened on the inside of the veneer, to hold the pieces of glass firmly in place. The camera housing is built to fit around the sides and ends of the opening, and of such dimensions as to fit the camera, with the back removed. The lid is hinged to the veneer so it may be opened for sliding the camera in and out. All joints, of course, must be made to fit close enough to exclude practically all light.

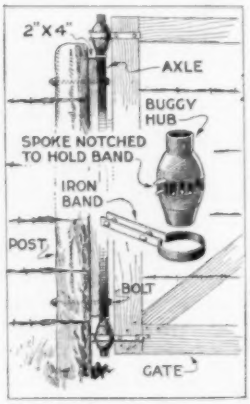
When the whole arrangement has been set up, the image of the negative is projected on the printing board through the open shutter of the camera. The projection is brought into focus on the board by manipulating the bellows backward or forward, as in focusing to take a picture. When the enlarged picture shows distinctly upon the board, the shutter is closed, and the printing paper is pinned in place with thumb tacks. The time necessary to print the picture should be tested by trial on a narrow strip of printing paper.

The length of exposure for printing is dependent entirely upon the condition of the light, the speed of the lens, and the grade of printing paper used. If desired, the equipment may be arranged for use with artificial light. This has the advantage of being permanently adjusted.

A few trials will probably be necessary before satisfactory results will be obtained, but the difficulties, which are largely a matter of gauging the exposures, will soon be overcome with a little practice. Favorite pictures may then be enlarged at a fraction of the cost of the commercial photographer's service, and the slight trouble and expense of constructing this simple outfit will soon be amply repaid.

Novel Hinges Made from Old Buggy or Wagon Axles

Exceptionally strong and smooth-working hinges that can be used advantageously about the farm are made from the hubs and axles of an old buggy or wagon. The spokes are removed from the hubs with the exception of one, which is sawed off and notched as indicated in the sketch. This notch forms a socket for fastening the strips of band iron used as supports for the gate. The axle is bolted to the gatepost. A gate so designed will last for years with no attention other than an occasional greasing.



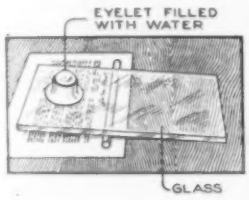
¶ Photographic work in the dark room is greatly improved by the use of distilled water in the preparation of solutions.

Aluminum Powder Used to Sharpen Dull Razors

Aluminum-bronze powder applied to a razor strop will coax a keen edge to many razors ordinarily difficult to sharpen. A little of the powder, which may be obtained at any paint store, is dusted over the surface of the strop, which should be previously rubbed with a cake of soap to make the powder stick.—Leon A. Haloin, Denver, Colorado.

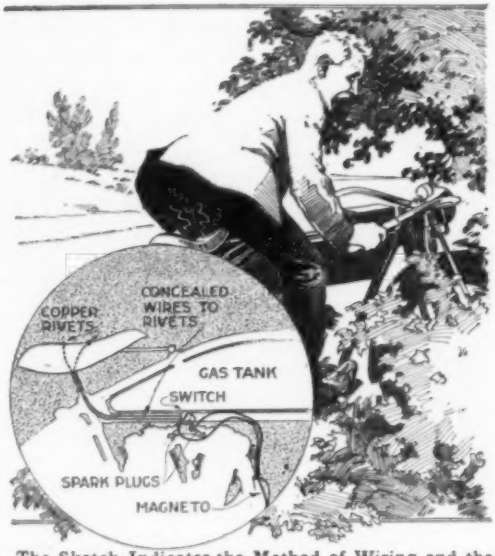
Water Lens Made of a Brass Eyelet

An interesting water lens may be made by applying shellac to the flange of a brass eyelet, such as is used for binding papers, and fastening the eyelet to a strip of thin glass, as shown. Care should be taken not to shift the eyelet as it will smear the shellac on the glass. When the shellac is dry, fill the eyelet with water with a medicine dropper. The water should be piled as high as possible over the rim of the eyelet. It is the resulting curvature that forms the lens and determines its magnifying power.



Shocking the Motorcycle Thief or Joy Rider

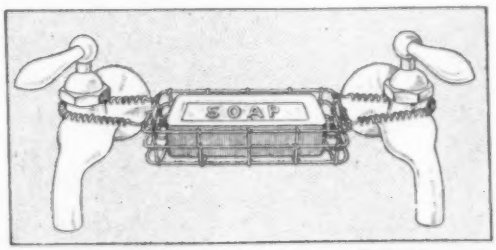
By equipping my motorcycle with a simple system of electric wiring I have discouraged a number of would-be joy riders and possible thieves who have tampered with my mount. Two copper rivets are set in the saddle and are connected by means of concealed, insulated high-tension wires with a switch, mounted on the lower horizontal frame bar. From the switch two wires connect with the magneto terminals at the point where they are attached to the spark plugs. When the machine is left unattended, the switch is turned on. Anyone attempting to ride away gets a terrific shock, usually about a hundred thousand times, before he can get off or fall off the machine. The idea is equally applicable to an automobile.—Edwin Edgerton, Alhambra, California.



The Sketch Indicates the Method of Wiring and the Effect When the Thief or Joy Rider Attempts to Ride Away

Soap Dish Fastened Conveniently to Water Faucets

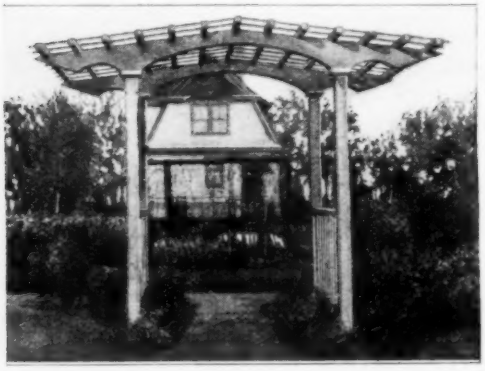
Soap dishes frequently are allowed to remain dirty because of the difficulty of removing them from their fastenings. Soldiers in a United States army cantonment have overcome this difficulty by mounting a wire dish on coil springs between the faucets, as illustrated. Thus the dish is at once in a handy position and easily removed.



The Coil Springs Hold the Soap Dish Securely between the Faucets and Permit Its Instantaneous Removal for Cleaning

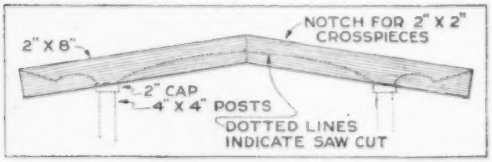
A Pergola Entrance for the Garden

In designing the pergola illustrated, leading from the informal to the more



A Few Boards and Simple Tools Constitute the Principal Requisites with Which Anyone of Fair Mechanical Ability may Construct This Pergola

formal planting of the garden, the aim has been to carry out in its lines a suggestion of the colonial door of the house. This is achieved by giving the top of the structure a curve similar to the usual curves of colonial architecture. The uprights are 4 by 4-in. clear planks. The railing has a top and bottom piece of 2 by 4-in. material with 2-in. square laterals. The curves for the top are sawed from 2 by 8-in. planks. The ends of these planks are abutted, and given the desired pitch, which is determined by trial. Then the curve is laid out. After one rafter has been worked to a satisfactory outline three more are made by using the first as a pattern, since in all four such curved rafters are needed, two for the front and two for the rear pair of posts. The rafters of each pair are spaced 2 in. apart. This manner of using four

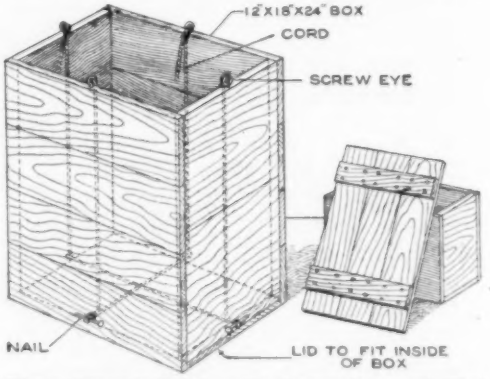


Upon the Correct Shaping of the Rafters will Depend Much of the Beauty of the Pergola

separate pieces does away with the need for heavy timber, while the effect is artistic and the construction fully as strong. The pieces extending at right angles with the rafters are of 2 by 2-in. lumber, and are held together with lattice strips. Six-inch square caps, 2 in. in thickness, afford a bearing for the rafters. Other dimensions, such as height, width, and length, should be determined by the needs of the location, and by actual trial, to get the most pleasing effects.—C. L. Meller, Fargo, N. D.

A Homemade Waste-Paper Baler

Waste paper may be neatly baled, as it accumulates in the home or small shop, by means of a homemade baler. Any ordinary packing case serves the purpose. The box is securely nailed, to insure strength, and the lid trimmed down to fit inside. Screw eyes are set into the central portions of the upper



Waste Paper is Baled as It Accumulates and Tied Ready for Market with the Aid of This Simple Receptacle

edges, as shown, and holes are bored, one in each of the sides, near the bottom. Stout cords are then tied to the screw eyes and passed through the holes, as indicated. Nails are inserted through loops in the cords, projecting from the holes. The paper is placed in the box as it accumulates, and pressed down by tramping on the lid, or by placing a heavy weight on it. When the box is filled, the lid is removed, the nails at the loops withdrawn, and the cords tied around the bale. The bale is then ready for disposal.—Arthur Giddens, Cleveland, Ohio.

Cuts for Printing Made from Linoleum

By HARRY MARCELLE

SERVICEABLE cuts having a wide variety of application, especially among shopkeepers, may be quickly made from linoleum. They may be trimmed to all manner of artistic designs, and printed in any desired color.

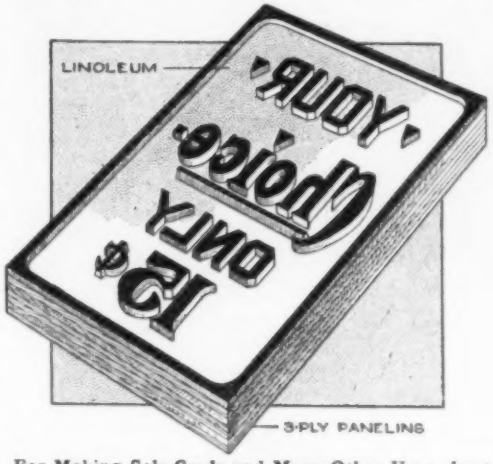
From a planing mill one should secure three pieces of ⅜-in. dry paneling. These are not expensive. A set of wood-carving tools will also be useful, but a small chisel and a sharp pocketknife make a fair substitute. Several feet of heavy linoleum are also required. This can usually be purchased as a remnant for a trivial sum. There are several grades of this, but only the heaviest of the noninlaid variety is suitable. Dark green and brown are the best colors to use, as they are mixed with bits of cork, and are therefore easy to cut.

After deciding upon the size of the cut, two pieces of the paneling are sawed off. A section of the linoleum is then trimmed to a size slightly larger than the finished cut is to be. Two thicknesses of the paneling with the linoleum added will make about the correct type thickness. The boards are then glued together. Glue is applied to the underside of the linoleum and it is then placed on top of the paneling. If a letter press is handy, it will be found useful for pressing the three pieces together until the glue is set. If no press is available the pieces should be heavily weighted until dry.

The surface of the linoleum may be slightly uneven. If so it should be leveled with a block covered with the finest grade of sandpaper. The cut design is then drawn on a piece of paper which is reversed, placed on top of the linoleum, and fastened with gummed stickers to avoid its being moved out of place while the tracing is being made. This is best accomplished by slipping a sheet of carbon paper under the layout. The entire design having been gone over, the paper is removed, leaving an exact reverse copy on the linoleum. If a border is desired it is laid out with a ruler or straightedge.

Before cutting into the design, one should practice on an extra piece of linoleum until accustomed to the depth of the fabric. Linoleum has a foundation of coarsely woven burlap, and this should not be cut through.

The knack of cutting will be readily grasped after one or two trials, and



For Making Sale Cards and Many Other Uses about the Store, Cuts Made of Linoleum Have a Wide Range of Application

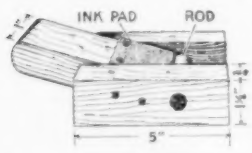
then the original cut may be undertaken. The knife should be held in a straight angle when cutting, and sufficient weight applied to make the cut penetrate through the filling until the burlap is reached. If the cutting is carefully done, the part of the design not wanted can be drawn from the burlap by picking up the edges, when the filling will strip off with slight effort. The sketch illustrates the cut as it appears when finished and ready for printing. This cut is designed to print colored letters and border on a white background. The combination may be altered, however, by cutting out the border and letters, so as to print white letters and border on a dark or colored background. If, for instance, a three-sheet stand is wanted, a design is made three sheets in height. Three boards, or cut blocks, are then made, one for each sheet, as the sheets are printed separately. Care must be taken that the cuts all register, or the finished printing will not match.

Device for Re-Inking Old Typewriter Ribbons

Being compelled to put a new ribbon on my typewriter every few weeks be-

By Using This Simple Ribbon-Inking Device the Same Typewriter Ribbon May be Re-Inked Until It Wears Out

cause the ink became exhausted, and noticing that the ribbons showed but little wear, I contrived the following method of re-inking which has proved thoroughly successful and has saved many dollars. Two 1½ by ¾-in. blocks, 5 in. long, were connected by means of a round brass rod, and at one end a piece of wood, 1 in. thick, was screwed between them in the slanting position illustrated. A piece of felt, to serve as an inking pad, was then attached to the slanting piece, as shown. I then bought record typewriter ink of the desired color and applied it to the inking pad with a small oilcan. When the ribbon needs inking, I detach one end, thread it over the pad, under the brass rod, and draw it through. The ribbon is moved gradually by turning the typewriter spool, and fresh ink is applied to the pad as it goes through. In this way the whole ribbon is evenly covered. The same ribbon may be re-inked and used five or six times before it wears out, and a dollar is saved each re-inking.—Arthur A. Richardson, Center Barnstead, N. H.

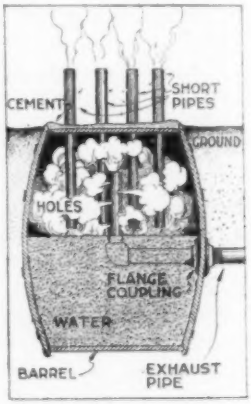


Huge Vegetables Produced by Artificial Feeding

Squashes, pumpkins, and other garden products, the principal bulk of which is composed of water, are cultivated to fairy-tale sizes, to be used as exhibition specimens, by the artificial introduction of moisture during growth. The usual practice is to split the stem and by means of an inserted tube supply water which is absorbed by the plant and furnished to the growing product.

Barrel Fitted as Silencer for Gas Engines

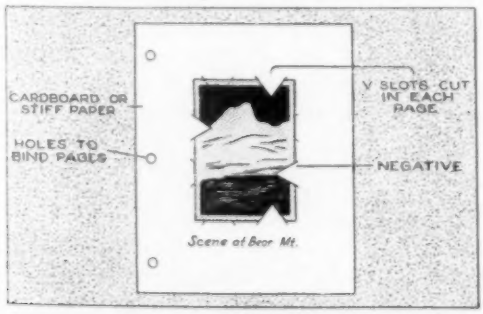
The noise of the exhaust from two gas engines became so objectionable to neighboring residents that some steps had to be taken to reduce it. A local mechanic effectually stopped the racket by the installation of the silencer shown. The device was built as follows: A pit was sunk just outside the engine room to accommodate a strong barrel. The exhaust pipe of the motors was then conducted to the pit, and extended into the barrel at the side, as detailed. The hole was made watertight with packed pipe flanges. The end of the pipe in the barrel was fitted with an ell and a short length of pipe, the upper end of which was about 6 in. from the top of the barrel. The opening in the end of this pipe was reduced to about half, and holes were bored in the side of the pipe. Four smaller lengths of pipe were then inserted in the barrel head, their lower ends on a level with the lowest holes in the exhaust pipe. The barrel head was covered with cement to reinforce it.



Water was poured into the barrel to a level just below the lowest holes in the exhaust pipe. The engine cooling-water pipe line was tapped into the exhaust pipe near the engines, and arranged to be regulated with a stop-cock, permitting a small flow of the warmed cooling water to pass out with the exhaust. Thus, this water is heated in the exhaust pipe, and the pipe also heats the water in the barrel. The steam carries off the exhaust gases, with only a slight hiss. If properly regulated, only an occasional addition of water is necessary, because of the inflow of heated water from the exhaust pipe. When the barrel needs cleaning, the top can be taken off and reset.

Photographic Negatives Filed Handily in Loose-Leaf Book

After experimenting with various methods of caring for negatives which were to be used from time to time, I mounted them on loose-leaf sheets, which were bound in a cover fitted with snap rings. This method made it possible to get at any of the films easily, and also to display them when desired. Titles were placed under each of the films, and two or more negatives were mounted on each side of each page, depending on the size. A standard pattern was made for each size of film, and a bunch of pages was cut with V-slots to hold the negatives, at one

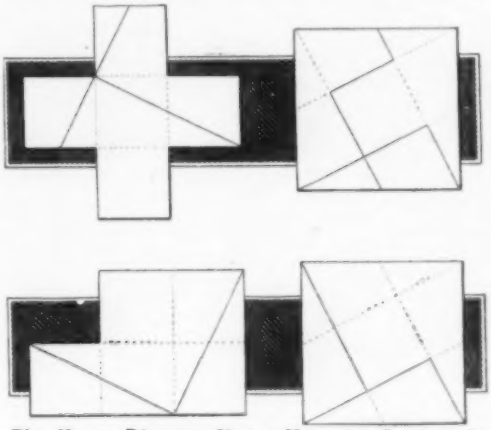


The Film Negatives are Mounted on Loose-Leaf Sheets of Uniform Size, Bound with Snap Rings

cutting. The holes were also punched in batches.—Howard Scott, Jersey City, N. J.

Two Puzzles That Require Only Paper and Shears

Pleasant diversion can be obtained by making a cross, all of whose arms



The Upper Diagram Shows How, by Cutting the Cross Twice, Parts can be Obtained to Make a Larger Square. The Lower Diagram Illustrates a Variation of the Same Puzzle

form squares and are of the same size, and attempting with two straight cuts of the shears to cut the cross into parts that can be rearranged to form a larger square. A similar puzzle consists in taking a piece of paper two squares wide and three squares long, with one end square removed, and by making two straight cuts obtain parts that can be formed into a square. The accompanying diagrams show how the desired results can be obtained.—John D. Adams, Phoenix, Ariz.

Portable Pen for Feeding Pigs in Field

Providing pigs with an abundance of fresh grass while at the same time keeping them penned up is usually somewhat of a difficult problem, but one that is readily solved by the use of a portable sty. The movable structure is built like an ordinary pig pen, but with two wheels supporting one end. This permits the other end to be raised slightly while the whole outfit, with pigs and all, is trundled off to new pasture. Once the pen is placed the animals are unable to move it.—Joseph Thalheimer, Venice, Calif.

Clothes Tree Converted into a Tent

At slight expense the clothes tree, which ordinarily detracts from the appearance of a lawn, may be covered with some suitable material to form an attractive play tent for children, as illustrated. Canvas, khaki, or any heavy cotton fabric, may be used. The top should be cut and sewed as indicated in the drawing, and the ground area is increased by cutting the wall panels wide at the bottom. Strips of tape conceal the seams in the covering and are also sewed to the base to serve as stake loops.—Mrs. H. M. Fulton, York Harbor, Me.

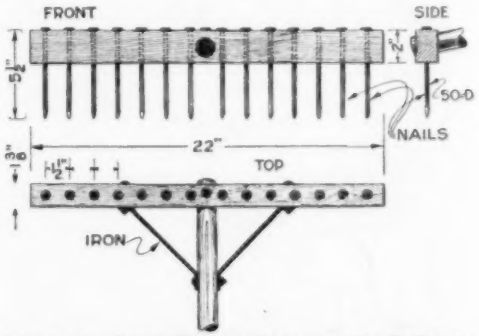
The Converted Clothes Tree Gives No End of Fun for Children and Is a Comfortable Lawn Canopy for Adults

Leaks in Roof and Drainpipe Repaired with Painted Canvas

The home mechanic is not always skilled in the use of sheet-metal patching tools, such as are necessary for repairing leaky metal roofs or drainpipes, and must find other methods. A substitute repair which I made years ago, and which, with proper care, has never leaked, was made as follows: The leaky spot was given a thick coat of paint. A piece of canvas was smeared with paint and pressed over the leak with the paintbrush. For leaks in drainpipes, a bandage of heavily painted canvas was applied. By painting the repaired part at reasonable intervals, the repair gives excellent service.—Thomas F. Maher, New York, New York.

Serviceable Garden Rake Has Spike Teeth

Prices of garden tools, like those of most manufactured articles, have advanced until much of the profit is cut from the home garden if they have to be purchased. The rake, one of the most essential implements, is one that is easily constructed in the home shop, and if made as indicated in the sketch, is quite as satisfactory as any commercial article. The head and handle should be of oak, or any clear, hard wood. A piece of round material suitable for the handle may be obtained at any planing mill for a nominal sum. The teeth, 14 in number, are 50-penny spikes. The holes for them, drilled in the head, are slightly smaller than the nails themselves, to insure a tight fit. The teeth are further secured by applying white lead in the holes before the nails are driven in. The handle braces may be of any soft strap iron. These are heated slightly for bending, and are bolted in place with three carriage bolts. The handle is given a driven fit into the head, and is held by a nail driven through and sawed off flush with the underside of the head. —A. P. Prentice, Trenton, N. J.

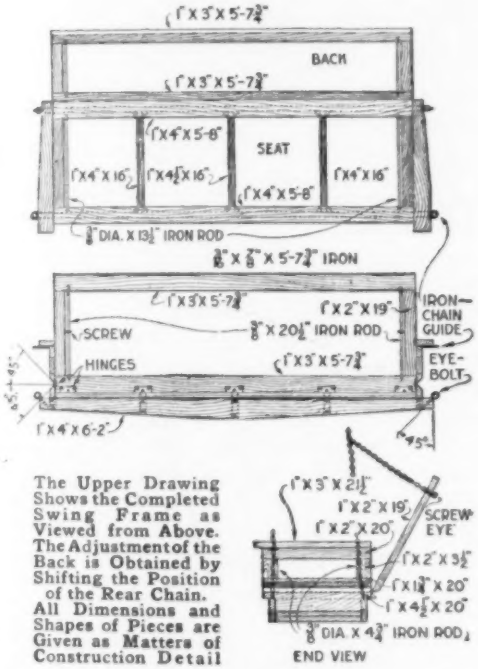


The Spike-Tooth Garden Rake may be Built at a Fraction of the Cost of the Commercial Article, and Is Fully as Serviceable

A Folding Porch Swing with Adjustable Back

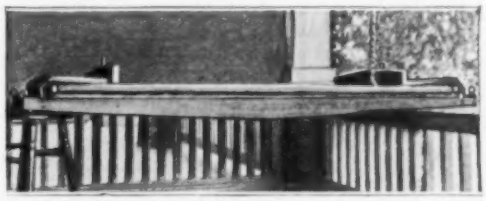
By C. E. WALLING

BECAUSE the usual type of porch swing cannot be reduced in size for storage, it is generally left on the porch all winter, with the result that it becomes more or less stained and weather-beaten. There are numerous folding swings on the market, but all of them are costly and ordinarily designed for the more or less temporary use of campers and summer-house sojourners. The homemade swing illustrated is thoroughly substantial, it is artistic in appearance, and may be



The Upper Drawing Shows the Completed Swing Frame as Viewed from Above. The Adjustment of the Back is Obtained by Shifting the Position of the Rear Chain. All Dimensions and Shapes of Pieces are Given as Matters of Construction Detail

folded, for storage in the hall closet, or for transportation by automobile. It is furthermore easily built, and the cost of its construction is but a fraction of that of the cheaper commercial articles. The frame is constructed of plain oak pieces, of the shapes and sizes indicated in the sketches. All are assembled with dowel pins and furniture glue. In selecting the lumber, care should be used to secure clear, even-grained stock. The under framework of the seat consists of two parallel members, as shown in the end-view diagram. These are joined together in the framework by the transverse structures, and later by the reed

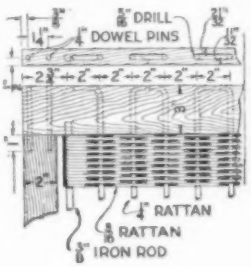


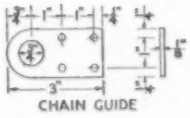
To Disconnect the Chains and Fold the Back and Sides of the Swing Takes But a Moment

construction of the seat. It will be noticed that a large eyebolt is placed to serve as a chain fastening in the forward horizontal seat-frame member. The chain after being secured to this eyebolt passes through a metal guide projecting from the underside of the swing handrails. The rear chain is fastened to a similar eyebolt in the corresponding horizontal frame member, but passes upward to the ceiling fastenings without a guide.

In constructing the frame, the seat part should be assembled first. The back and sides are then made and hinged to the seat, as in the sketches. Brass or bronze hinges should be used. Steel hinges may be used, but they are prone to rust. Brass or bronze hinges will cost more, but they will give value received in service.

The back of the swing is supported in the reclining position desired, or at right angles with the seat, by two lengths of chain, as shown in the end-view illustration. These chains are fastened to eyebolts in the back, and at the other ends by means of hooks which engage the upright chains, to secure the necessary degree of adjustment.



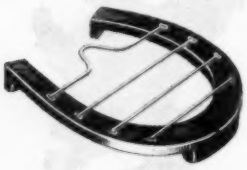


After the frame structure is completed and assembled, the weaving of the rattan is begun. For this, one will

require 12 lb. of No. 7 American reed, 12 ft. long, and 4 lb. of No. 5 reed. The manner of weaving is shown in the detail sketch. The iron rods, to which the rattan is secured, are, of course, set in place before the final board of the several sections are put in. After being installed, the rods should be given a coat of white lead, to preclude any possibility of their becoming rusted and staining the rattan. The completed swing is sandpapered smooth over all, all dowel joints are puttied, and the whole framework given a coat of wood stain of the color desired. When the stain has set thoroughly, two coats of spar varnish are applied over the structure, rattan and all.

Horseshoe Easily Converted into Handy Sadiron Holder

Tailors, and other users of flatirons, may provide themselves with a convenient bench rest by wiring a horseshoe as indicated in the sketch. Heavy, stiff wire should be used, and after being bent and driven through the nail holes, it is cut off and riveted. The finished rest should be treated with a coat of fireproof enamel.



Device for Hanging Second-Story Storm Sashes

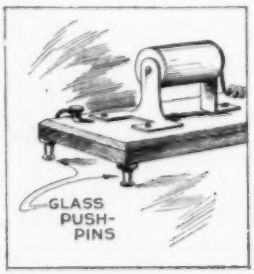
Putting up or taking down second-story storm sashes is usually difficult, but may be simplified by the use of a rope, screw eyes, and a small pulley for hoisting into position. The pulley should be lashed to a small harness snap, and a second snap attached to the rope. A ladder is used to place a screw eye in the upper part of the window frame, and the pulley is then snapped into the eye. A second eye is set in the upper outside edge of the sash. The rope is then snapped into this and over the pulley. The sash is hoisted to within 3 or 4 in. of its position and is secured by tying the rope to a round of the ladder. The sash may then be easily lifted into place, and after the cleats are turned, the rope and pulley is removed. The screw eyes should be painted the same color as the sash to render them inconspicuous and prevent rust.

Arithmetical Process Determines Which Hand Conceals an Object

It is not difficult to determine in which hand a person conceals an object if he is led through the following arithmetical process. One should have him assign the value of four to the hand that conceals the object, while the other hand is given the value of five. Then ask him to multiply the number of the right hand by three and that of the left hand by two; to add the products and tell if the sum is odd or even. If even, the hand that conceals the object is the right one. If odd, it is the left hand. As soon as this has been tried over in one's mind a few times it will be seen why this is true. The victim can hardly suspect the trick and if he follows the directions is sure to tell which hand conceals the object.

Glass Pushpins as Feet for Instruments

Experimenters desiring to insulate the bases of electrical, or other, instruments find that the appearance of the device is improved when porcelain insulators are used for feet. By setting a glass pushpin in each corner the instrument is at once effectively insulated and made to look quite attractive. The pushpins are procurable at any stationery or photographic-supply shop at a trivial cost.

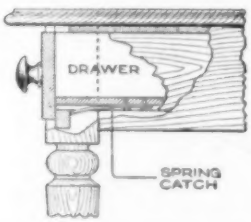


Cutting Smooth Female Threads in Hard Wood

The cutting of female threads in hard wood is accomplished with greater accuracy and ease if the hole is first impregnated with beeswax. This should be done by filling the hole and then inserting a heated wire, or nail. It should not be so hot as to scorch the wood, but yet hot enough to melt the wax. The wax should be permitted to cool before the tap is applied. The threads will then cut accurately and without binding the tool.

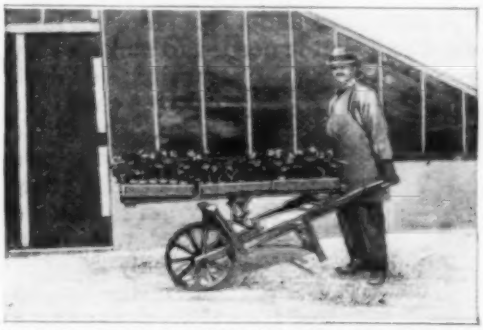
Spring Catch Prevents Child from Opening Drawer

To prevent the baby from pulling out the drawer in the kitchen table, I attached a flat steel spring to the bottom of the drawer, as shown. The drawer had enough play under the table top to permit it to be raised slightly in releasing the catch. The baby, however, would pull straight out on the drawer, and soon lost interest in it when the drawer would not open.—A. J. Viken, Waterloo, Iowa.



Elliptical-Spring Wheelbarrow an Aid to Florists

Potted plants are usually bulky, always heavy, and cannot stand a great deal of jouncing when being moved about, hence their transportation has always been more or less of a problem with florists. By providing himself with a wheelbarrow equipped with a large flat tray mounted on an elliptical spring, a florist has eliminated all short-haul difficulties. The box being hooked at the end near the barrow handles, is relieved of jolts and jars by the operator's body. The bulk of the weight is carried on the spring, which absorbs vibrations from the barrow wheel. The tray held six rows of small potted plants, with 21 plants



With the Spring-Tray Wheelbarrow a Large Number of Potted Plants may be Moved in One Load without Sufficient Jar to Damage Them in Any Way

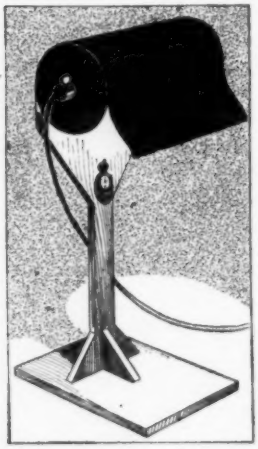
in each row, making 126 plants to a load. For work about the greenhouse the vehicle meets all requirements.

Music Stand Easily Adapted as Copy Holder

An ordinary music rack was converted into a copy holder for use at the typewriter, and in other ways also, and proved superior in several features. The vertical adjustable rod of the stand, on which the music rack is set, was bent at two right angles, one at the junction of the rod with the rack, and the other directly above the tube standard. The copy is placed on the rack under the clips in the usual manner, and the vertical adjustment made as desired. This stand overcomes the common objection to copy holders fastened directly to the typewriter stand, in that there is no vibration of the holder when the typewriter is in operation. The arrangement folds compactly in the usual style.—Howard E. Cooper, Canon City, Colo.

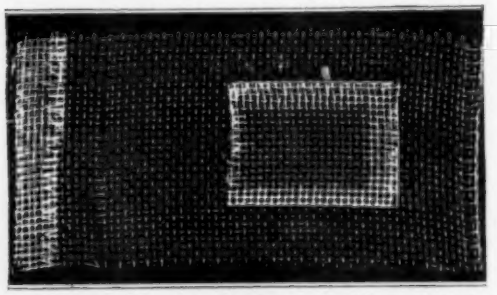
Typewriter or Desk Lamp Made of Coffee Can

A coffee can and a few pieces of lumber are all that is needed to make a very serviceable desk or typewriter lamp. The can is slit along one seam and a quarter cut made either way from the slit, at each end of the can, so that the sides can be bent out, one serving as a shade and the other as a means for attaching the reflector to a standard. The latter consists of a slender upright, with a triangular head, set and braced in a base, measuring 5½ by 10 in. The light bulb is set in a socket soldered in one end of the reflector.



Practical Method of Patching Fly Screens

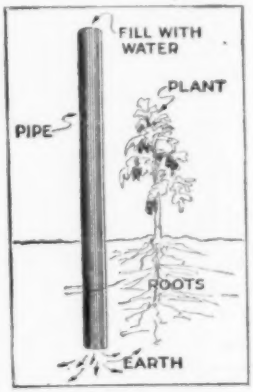
Fly screens are often needlessly discarded because of the difficulty in patching them satisfactorily. By using the method shown in the photograph of two typical patches, this work is made easy, and the result is a neat patch. First trim the hole in the screen to a rectangular shape. Then cut a section of screen, ⅜ in. wider, all around, than the opening. Using a metal strip, or other suitable tool, bend the short ends of wire around the patch, and also around the hole, outward from the surface of the screen. Place the patch over the hole, so that these small wire ends project on either side. Bend them over and flatten them neatly against the screen. This produces a secure fastening, which will not admit insects or become loosened easily. The method may be used also in joining two pieces of screen wire to form a larger piece, by making a wider lap joint, as shown at the left.—T. J. Hubbard, Mendota, Ill.



A Neat, Substantial Patch can be Made Quickly by Applying a Small Section of Screen by the Method Described

Watering Plants at Midday through a Pipe

Knowing that it is bad practice to water growing plants in the ordinary way while the sun is beating down upon them, and being unable to get irrigation water except at midday, I inserted pieces of 2-in. pipe, 20 in. long, into the ground about 6 in. from the plants to be watered. These I filled with water which gradually seeped about the roots. If desired, the pipes can be used also as supports.—R. Poston, Flat River, Mo.

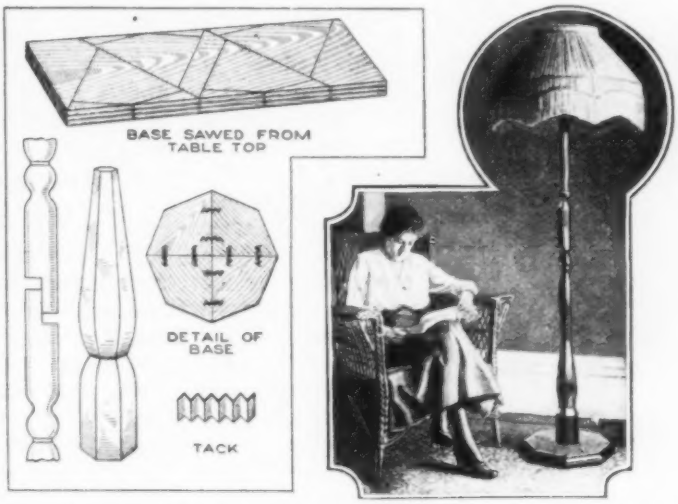


Old Buggy Tires Provide Strap Braces

Steel buggy tires, or other varieties of old strap steel, or iron, may be readily converted into substantial braces for boxes, posts, or even for cross arms on telephone poles, which use was made of such old tires, quite extensively, in an emergency. The strips are sawed to the required lengths, and holes are drilled in them, and countersunk if necessary, to provide a suitable means of fastening with screws or bolts.

Floor-Lamp Standard Made of Old Table Parts

Good use was made of the turned legs of an old table, and a section from the table top, by converting them into a floor-lamp standard, as shown in the illustration. The octagonal base was made by sawing four sections from a part of the table top, and joining them carefully in glue joints, held by corrugated tacks, as shown in the detail. The edge of the base was neatly beveled, as indicated in the photograph. The heavy portion of one of the legs was trimmed to an octagonal section, as shown, and two of the lower ends were joined in a halved joint, as indicated at the left. The joint was glued and fastened with countersunk wire nails. The octagonal part of the standard was fastened to the upper portion by means of a central bolt, fitted tightly. The base was fastened to the standard with screws. The parts were all carefully smoothed and scraped, and then sandpapered to a cabinet finish. When the work was stained and varnished, the effect was quite satisfactory.



Parts from an Old Table were Shaped, Joined Together, and Properly Finished to Make This Substantial and Neat Standard for a Floor Lamp

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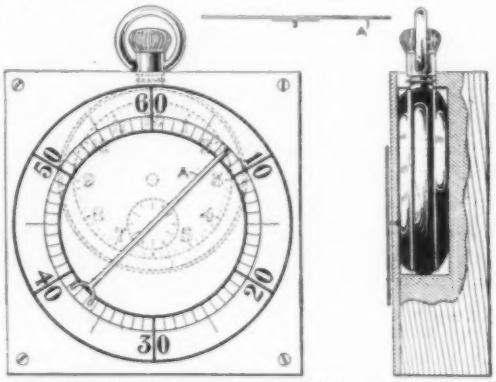
Watch Fitted for Timing Photo Prints

An inexpensive watch was converted into a worth-while timing device for use in photographic work by fitting it into a suitable wooden case, and providing a special dial for the second hand. The hour and minute hands were removed, and the watch fitted snugly into a wooden block, bored out to receive it. The cover for the block was made of cardboard, and served as the new dial. It was laid out with the shaft of the second hand as the center, as shown. The new hand A, made of a very fine piece of wire, was soldered to the small hollow shaft of the second hand. The wire is flattened to give greater width, and to make the soldering easier. If desired, an opening can be left at the center of the dial, large enough so that the new hand can be soldered directly to the second hand, the new hand being bent to conform to the raised surface of the dial.



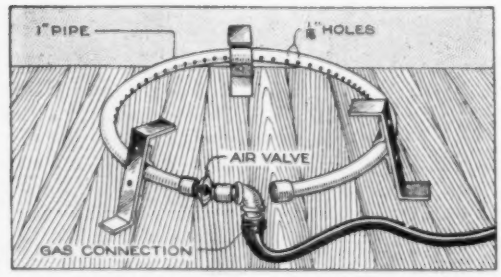
Photographic Prints can be Timed Accurately by the Use of an Inexpensive Watch Specially Fitted for the Purpose

Rubber Bootlegs Provide Chute for Picking Fruit

To form a chute from my picking hand to the basket in which I dropped the fruit, I used two old bootlegs. These were cut from a pair of discarded hip boots and riveted together, as in the sketch. Two straps, long enough to reach around the arm, were fastened to the upper part of the chute, as illustrated. The basket is suspended with a shoulder strap in such a position that an apple dropped down the chute rolls into it. For picking soft or overripe fruit a canvas tube might be attached to the lower end of the chute and extend to the ground, where the fruit could be caught and sorted by a helper.

Simple Gas Stove Made from Ring of Pipe

A simple yet thoroughly satisfactory gas plate may be made by bending a short length of 1-in. pipe into the form of a circle, providing it with an air valve and the necessary escapement holes. Before bending, both ends of the pipe should be threaded. A cap is then screwed on one end. Spaced ½ in. apart, along the side that is to form the inside of the circle, 1/16-in. holes are drilled. The holes should be drilled before the pipe is bent. Three legs are provided. These are pieces of wrought iron, bent and clamped as shown in the sketch. The legs also serve as supports for the receptacle to be placed over the fire. An old gas-stove air valve is usually obtainable in any junk yard, and is attached to the pipe as indicated, and connected with the gas tube.

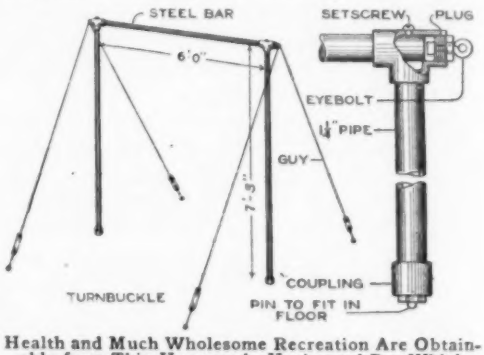


A Length of Pipe and a Few Fittings Reclaimed from the Junk Pile are Assembled to Form a Handy Gas Heater

Gymnasium Horizontal Bar for Amateur Athletes

A practical horizontal bar may be constructed from iron pipe and fittings at a cost considerably under that of the commercial gymnasium article. The style described and illustrated is known as the "fixed portable," inasmuch as it remains at a fixed standard height but may be readily disassembled, or set up as desired. The uprights are made from 7 ft. 3-in. lengths of 1¼-in. galvanized-iron pipe. Each is threaded at the upper end with about six threads, and to one end of each a T-coupling is fitted. The lower ends are provided with plugs attached by means of couplings which are turned or filed down to form round pins, about ¼ in. in diameter. These pins are fastened into sockets on the floor to hold the bar.

The T-joints at the top of the uprights should be screwed on securely. One end of each tee is then fitted with a plug which is tapped and fitted with

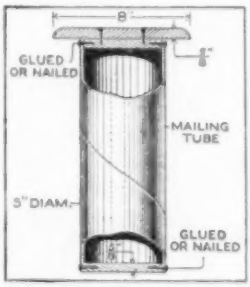


Health and Much Wholesome Recreation Are Obtainable from This Homemade Horizontal Bar Which is Built from Pipe Fittings at Nominal Expense

an eyebolt, as in the sketch. The tops of the tees are also tapped and threaded to take a small setscrew. An ideal horizontal bar is made from a piece of steel tubing, 6 ft. in length and 1 in. in diameter. If steel tubing is not readily obtainable, a length of 1-in. pipe may be used. It should be smoothed with emery cloth and oil, and then given a coat of shellac. A polished steel bar is the most satisfactory, as it has more spring and life than a pipe. The supporting guy ropes are of ⅜-in. cable. These are spliced to the eyebolts in the tops of the uprights. The cables should be long enough to extend outward at a wide angle. Common turnbuckles are attached to the lower ends. These hook into eye plates that should be countersunk into the floor. Two ring washers form the sockets in the floor to accommodate the uprights. To erect the bar, the horizontal member and the uprights are assembled, after which the uprights are set in the sockets, and the cables put in place and tightened. Care should be used to see that all fastenings are secure, as the loosening of these might be the cause of a serious accident.—L. B. Robbins, Harwich, Massachusetts.

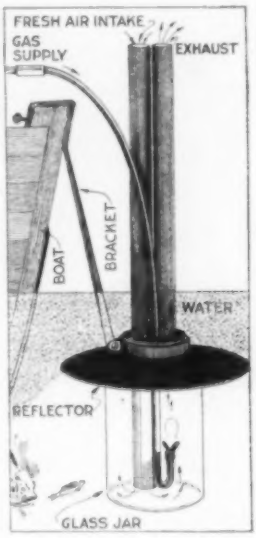
Novel Stool for Workbench Made of Paper Tube

A serviceable stool for use in the home workshop and at the drafting table was made from an old mailing tube, 5 in. in diameter, having a thick wall of paper. The tube was cut off squarely to the desired height, and wooden disks nailed into the ends, as shown. A board, 8 in. in diameter, was nailed to the top of the support, and provided a suitable seat. The stool is light and easily transported, besides being a distinct novelty.



Submarine Gas Light Used for Spearing Fish

In those states where the spearing of fish is legal, great sport is provided by spearing at night with the aid of a submerged artificial light. An excellent light for this purpose is made from a two-quart screw-top fruit jar, fitted with an acetylene-gas burner as illustrated. The porcelain, or glass, lining is removed from the cover. Two ½-in. holes are then bored in the metal and into these ½-in. tin tubes, such as are commonly used in the construction of speaking tubes, are inserted and soldered. In a third hole a ⅛-in. copper tube is soldered, to serve as a supply line to the gas jet. This tube is soldered to the sides of the air inlet tube and is then bent upward in the shape of a "U." At the tip of the "U," the gas jet is screwed and soldered. A bracket, as indicated, is fitted to support the lamp from the stern of the boat. A reflector is also provided to project the light downward and away from the spearman's eyes. The finished lamp is operated by gas furnished by a carbide generator, or storage tank, carried in the boat. It may be submerged to any desired depth so long as the ventilating tubes are kept above the surface. In clear water the illumination will penetrate to a considerable depth, and many a fish will pay the penalty of his curiosity by getting within range of the spear.—Joseph T. Sproule, South Norwalk, Conn.



¶A piece of cord is useful as an emergency gauge in resetting a camera tripod, or in preventing it from shifting.

An Automobile Hammock for Baby

Six screen-door springs, a barrel hoop, and a yard of heavy cloth were

The Baby Is Thoroughly Comfortable on Daily Auto Airings When Resting in the Hammock

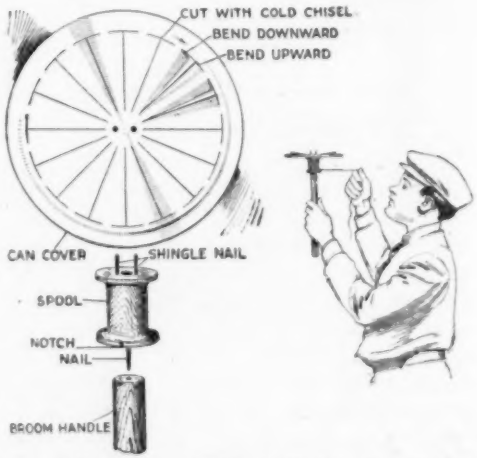
the materials necessary to make a baby's hammock for the auto tonneau, which gives useful service and comfort. The hammock takes the place of the third person in the rear seat, as shown. It can be quickly attached or detached, and swings baby safe from jolting. The hoop was from a barrel, 16 in. in diameter, and was cut in half, each half holding one end of the hammock. These half hoops were held 30 in. apart by means of heavy cloth sewed to them. Attached to each half hoop are three screen-door springs, cut the right length to hold the hammock in a nearly horizontal position, when the baby is not in it. The springs are wired to a ring at each end, and the rings slip over hooks at the supports. When baby and the pillows are placed in the hammock, it sags down just enough to be comfortable. The blanket and pillows can be placed to cover the springs also, thus accommodating a larger child.

Gunny Sacks Handy in Getting Auto Out of Mud

An autoist who is on the alert for practical kinks useful on the road, carries several gunny sacks, neatly folded, in a compartment of his car. When he strikes a muddy spot in the road, where there is danger of being mired by the repeated slipping of the driving wheels, he makes use of the sacks. They are folded lengthwise and laid directly in front of the driving wheels. This gives the necessary traction, and the car soon draws itself out of the mud. The sacks are recovered if the probability is that they will soon be needed again, and may be washed at a near-by pump or stream, if necessary.

High-Flier Toy Made from Can Cover

A mechanical toy that will climb through the air and almost out of sight may be made by any boy from the cover of a gallon can, as shown in the sketch. After being notched as illustrated, the blades are bent to form a miniature 16-bladed propeller. This is mounted on a spool which turns on a nail pivot in a socket made from a length of broom handle. An ordinary top string is wound around the spool and withdrawn suddenly to set the flier spinning and soaring into the air. It will continue to rise until its whirling force is expended, after which it will start spinning in the opposite direction and fall to the earth. On windy



When Made into a Tiny 16-Bladed Propeller the Can Cover is Mounted on a Spool and Sails into the Air by being Revolved Like a Top

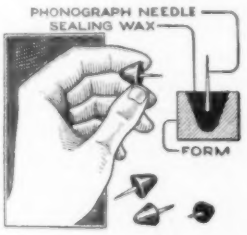
days it will provide great sport by traveling a considerable distance. Contests between several boys provided with such fliers are interesting.—Dale R. Van Horn, North Loup, Neb.

Barrels Strengthened by Nailing Extra Hoops on Inside

Barrels used for various purposes around the shop or home premises often give way unexpectedly by the breaking of the reinforcing hoops. The life of even a light barrel can be extended greatly by doubling the hoops. The additional bands are nailed on the inside of the barrel, thus giving a solid setting for the nails, which are clinched into the outer hoops. I have used this method on barrels which have served three years for the storage of ashes, and they are still in good condition.—D. A. Bourbeau, Beverly, Mass.

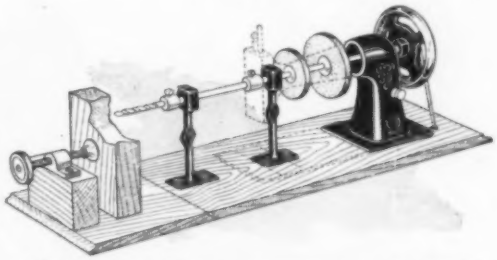
Pushpins Made from Old Phonograph Needles

Amateur photographers, and others whose work calls for numbers of small pushpins, may effect a considerable saving by making them from old phonograph needles as illustrated. A needle is held with a pair of tweezers in a small form, which may be made from wood, while molten wax is poured in around it. When the wax has hardened, a sharp tap on the bottom of the form dislodges the completed pushpin.



Grinder, Polisher, and Drill Made from Old Sewing Machine

A sewing machine that has reached the stage where it can no longer be profitably repaired, may be converted into an excellent grinding, polishing, and boring tool, as illustrated. The hollow iron housing, or main arm, is cut off with a cold chisel, the edges are filed smooth, and just enough of the structure is left to support the main bearing of the flywheel. All of the gears are removed. The loose end of the main shaft is supported by using one of the steel arms taken from the

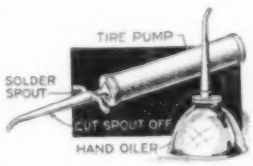


With a Few Simple Alterations an Old Sewing Machine is Rebuilt into a Serviceable Tool for Household or Home-Workshop Use

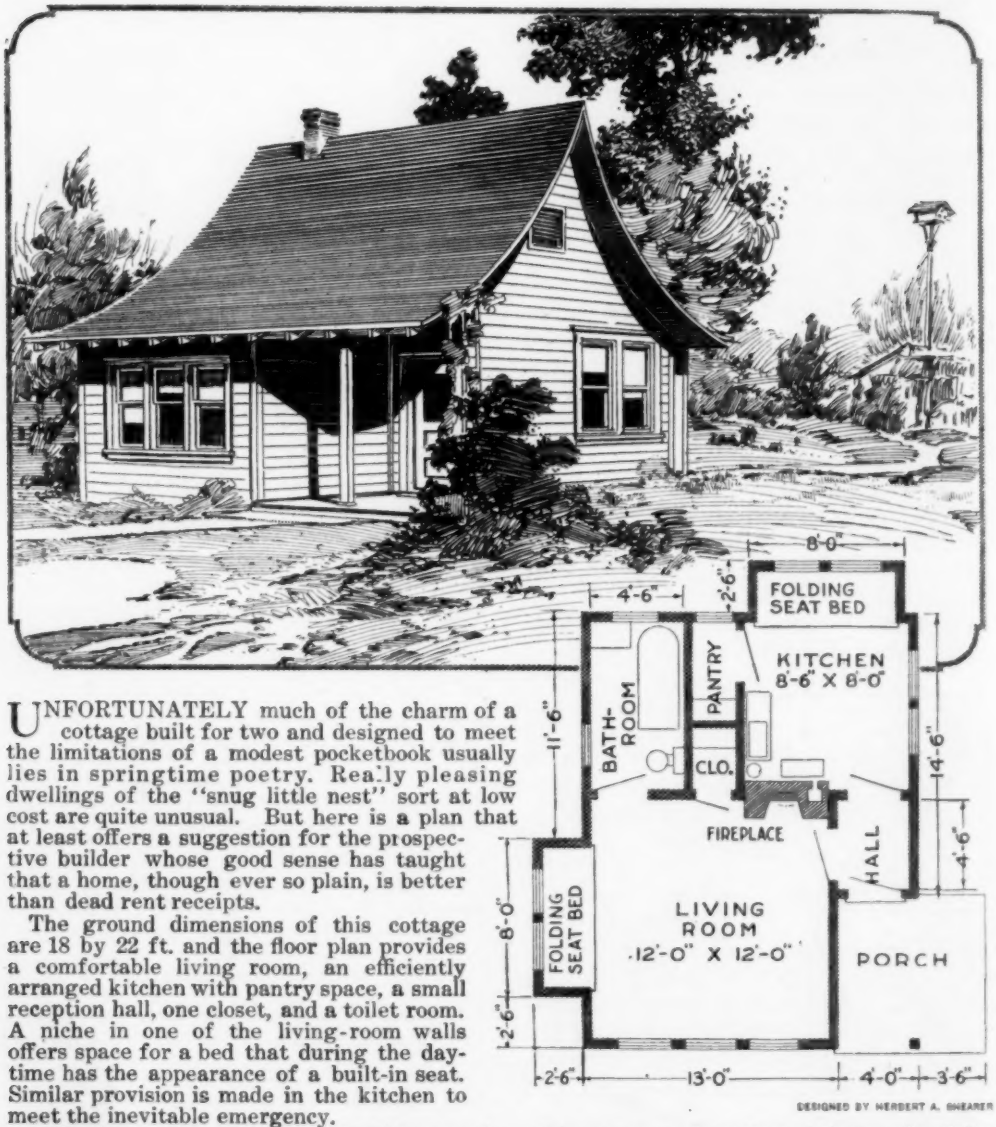
under mechanism of the machine. The bearings in the ends of these will exactly fit the shaft. A 4-in. emery wheel, and a 5-in. felt buffer, for polishing, are then mounted on the shaft, and on an extension, coupled to the shaft by means of a collar and setscrew, the drill chuck is fitted, as in the sketch. To secure the necessary pressure for drilling, the screw portion of an old wood clamp is mounted on a block, as shown. This block should be of hard wood and screwed securely to the machine base. The machine is thoroughly satisfactory for light work. It might readily be fitted with a small circular saw, a lathe chuck, or other attachments one might desire.—Norman Harris, Toronto, Ont., Can.

Oil and Grease Gun Made from Bicycle Pump

An oil and grease gun that has many uses about the automobile, or almost any form of machinery, may be made by fitting the spout of an ordinary oilcan to a bicycle pump of the pocket type. The spout should be sawed off close to its base and soldered securely to the hose connection of the pump. By unscrewing the body cap of the pump and removing the plunger the cylinder may be filled with oil or grease. After reassembling, the lubricant is discharged as desired.



MODEST COTTAGE FOR EQUALLY MODEST PURSE



DESIGNED BY HERBERT A. SHEARER

UNFORTUNATELY much of the charm of a cottage built for two and designed to meet the limitations of a modest pocketbook usually lies in springtime poetry. Really pleasing dwellings of the "snug little nest" sort at low cost are quite unusual. But here is a plan that at least offers a suggestion for the prospective builder whose good sense has taught that a home, though ever so plain, is better than dead rent receipts.

The ground dimensions of this cottage are 18 by 22 ft. and the floor plan provides a comfortable living room, an efficiently arranged kitchen with pantry space, a small reception hall, one closet, and a toilet room. A niche in one of the living-room walls offers space for a bed that during the daytime has the appearance of a built-in seat. Similar provision is made in the kitchen to meet the inevitable emergency.

The interior arrangement, it will be seen from this, corresponds to that of thousands of city apartments occupied by small families in poor, moderate, and even affluent circumstances. In addition there are advantages that so-called "collapsible" apartments scarcely ever afford. There are windows on four sides, there is a porch, a cheery fireplace unmarred by a gas log, a front yard with a chance for real grass, a back yard with space for a vegetable garden and flowers, and moreover there is that greatest of all comforts, privacy.

The architect estimates that the house could be erected for about $600. In warm climates the cost would be even less, perhaps. This is equivalent to two years' rental of a stuffy $25-a-month flat, or one year's rental of a similar apartment in a somewhat more desirable neighborhood. The plumbing need not cost more than $300 and could be installed for much less, were one resourceful.

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